Ch 6 Bonding

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Chemical Bond

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Chemical Bond - electrostatic link blw 2 atoms
Resulting from an attraction of one
atom's nuclei for the other atoms e- (vice versa)

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bond forms from sharing e-

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$H\cdot + H\cdot \longrightarrow H:H$

Ionic
link blw 2 oppositely charged ions

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Ionic
link blw 2 oppositely charged ions

$Na\cdot + :\ddot{C}l:$

Ch 6 Bonding

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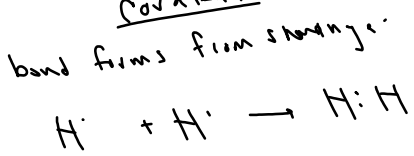
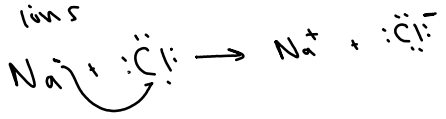


Ionic
link blw 2 oppositely charged ions



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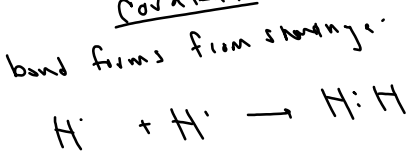

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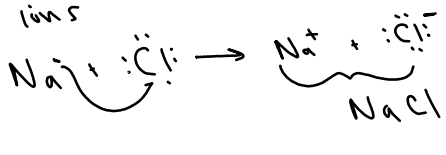

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form blw nonmetals

Ionic
link blw 2 oppositely charged ions

$Na\cdot + :\ddot{C}l\cdot \longrightarrow Na^+ + :\ddot{C}l:^-$

Na ox Cl Red

$NaCl$ ← Binds Bc ions form bc ions attract each other

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link b/w 2 oppositely charged ions

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form b/w metals/nonmetals

Not all covalent bonds are equal in e⁻ sharing

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↳ atoms have diff energy

e⁻ neg difference
b/w atoms

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(atoms have diff energy)

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No difference

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• No difference - Non polar Ex H–H

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b/w atoms
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- Small-Med diff

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Not all covalent bonds are equal in e⁻ sharing
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e⁻ neg difference
b/w atoms:
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- Small-Med diff - Polar covalent Ex H–Cl

Not all covalent bonds are equal in e⁻ sharing
(atoms have diff energy)

e⁻ neg difference b/w atoms:

- No difference - Non polar Ex H–H
- Small-Med diff - Polar covalent Ex H–Cl
- Big diff Ionic Ex NaCl

Bonds form to get lowest possible PE

Covalent Bonding (cont.)

Bonds form to get lowest possible PE

Covalent Bonding forms

molecule -

Bonds form to get lowest possible PE

Covalent Bonding (term)

molecule - 2 or more atoms held together by covalent bonds that exist independently

Bonds form to get lowest possible PE

Covalent Bonding terms

molecule - 2 or more atoms held together by covalent bonds that exist independently

CO_2, $C_6H_{12}O_6$, NO_3^- nor SO_4^{2-}.

Bonds form to get lowest possible PE

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Bond E- E Reqd to Break a chemical Bond

Bonds form to get lowest possible PE

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Bond E- E Req'd to Break a Chemical Bond ← higher BE more stable Molec it

Bond Length - dist b/w 2 nuclei of bonding atoms

what's happening w/ Bonds

what's happening w/ Bonds

H·

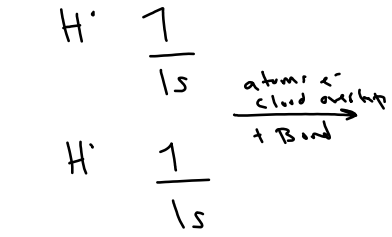
H·

what's happening w/ Bonds

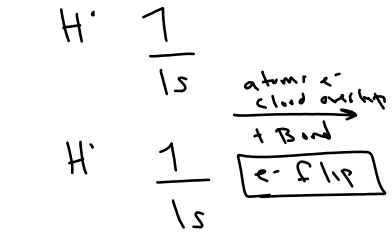
H· $\frac{\uparrow}{1s}$

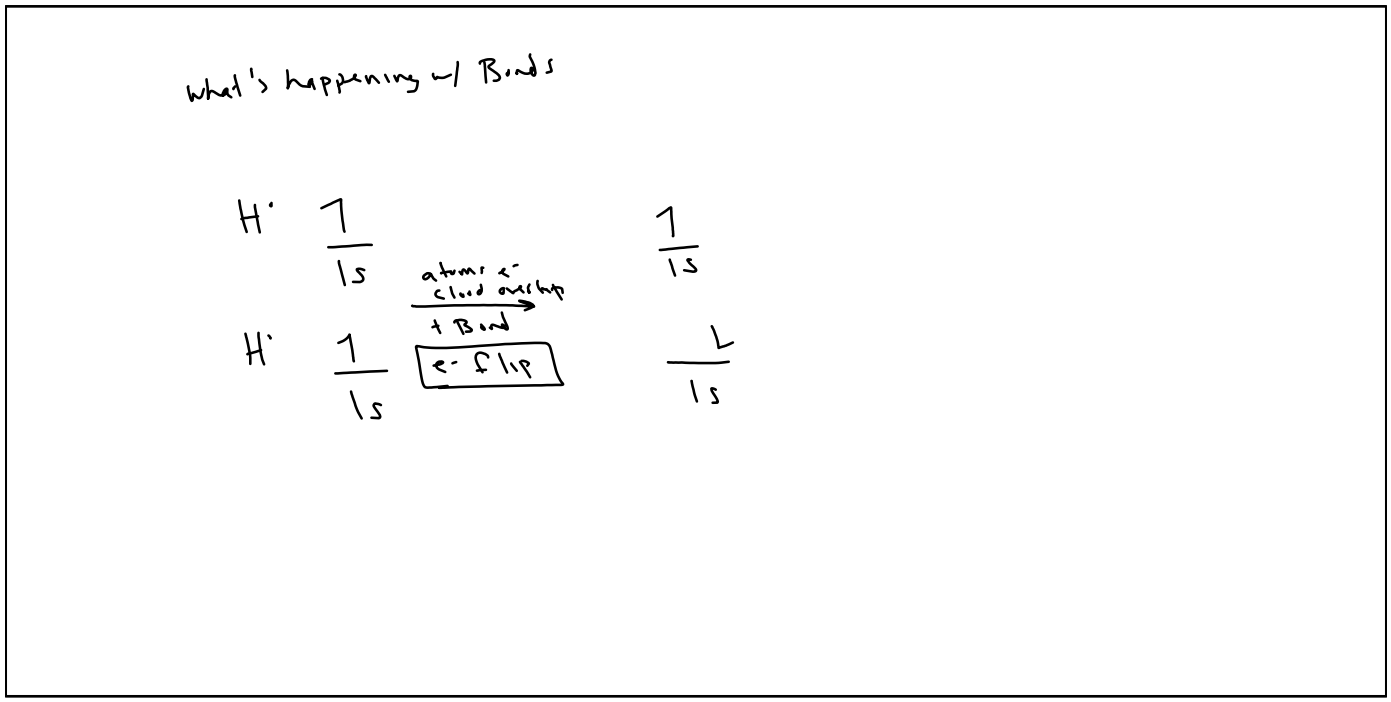
H· $\frac{\uparrow}{1s}$

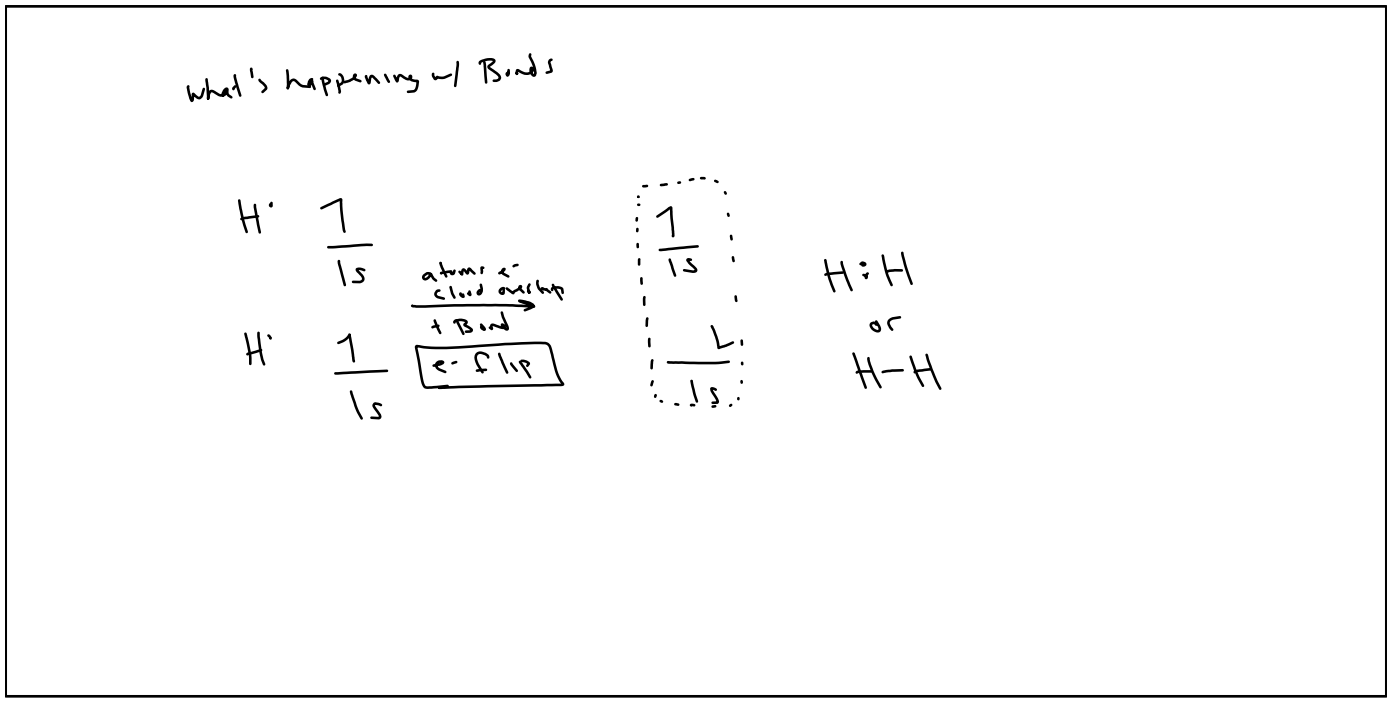
What's happening w/ Bonds



what's happening w/ Bonds




What's happening w/ Bonds
H·
1s
1s
atomic e⁻ cloud overlap
+ Bond
H·
1s
e⁻ flip
1s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1s
H·
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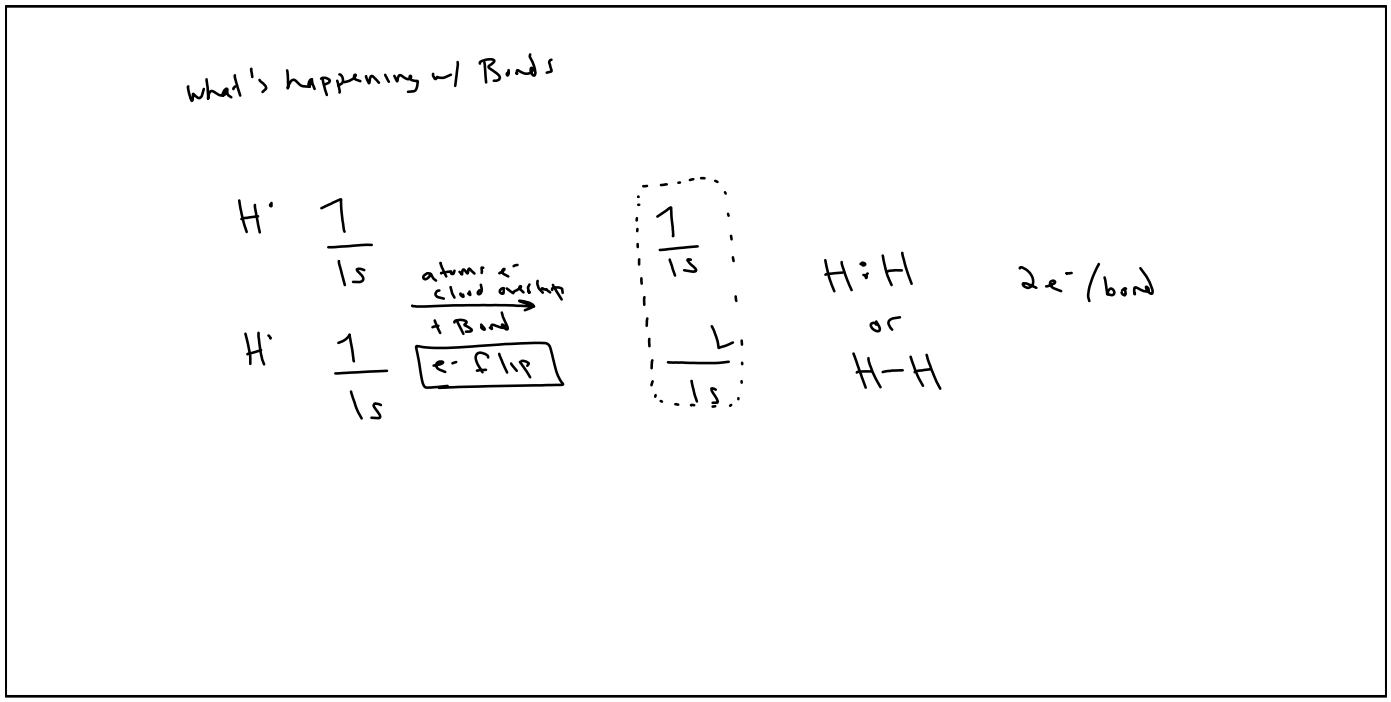
atomic e⁻ cloud overlap
+ Bond
e⁻ flip
1s
1s
H:H
or
H–H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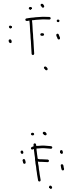
1s
H·
1s
atomic e⁻ cloud overlap
+ Bond
e⁻ flip
1s
1s
H:H
or
H–H
2e⁻/bond

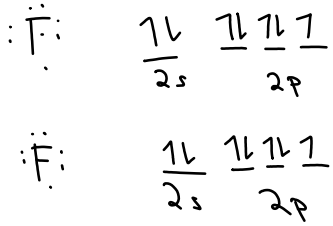
What's happening w/ Bonds

In F_2



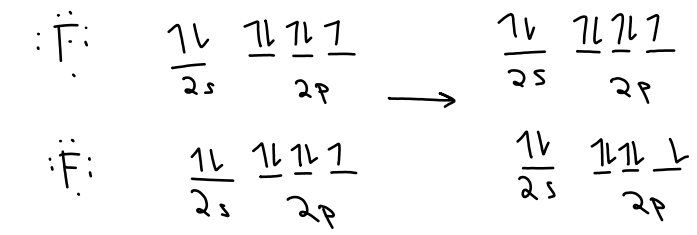
What's happening w/ Bonds

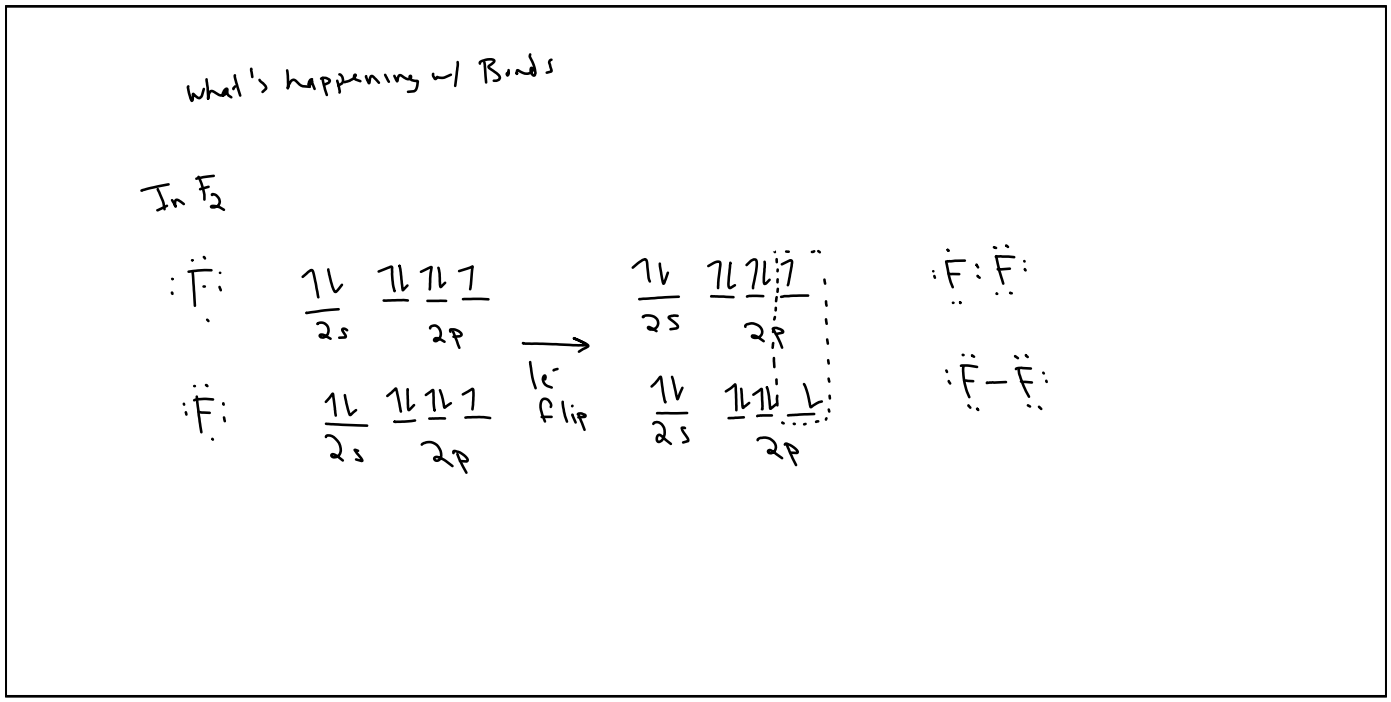
In F_2



What's happening w/ Bonds

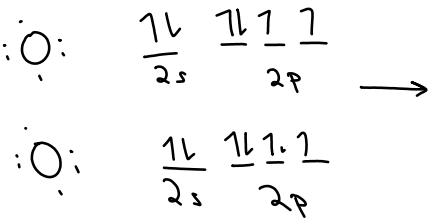
In F_2




What's happening w/ Bonds
In F_2
2s
2p
1e⁻ flip
2s
2p

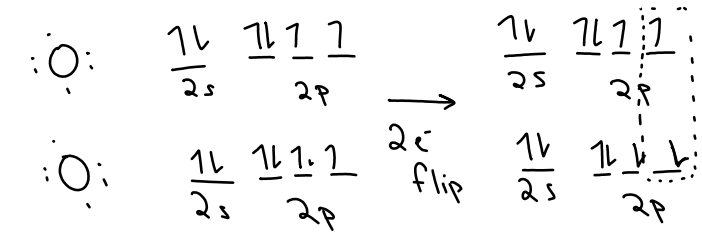
What's happening w/ Bonds

In O_2



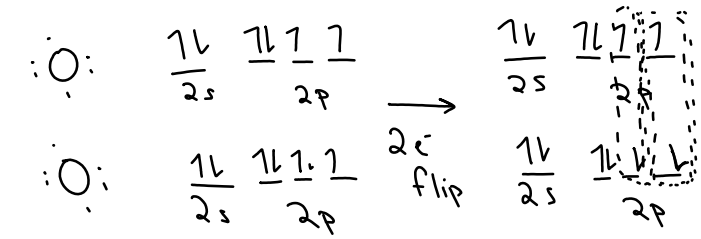
What's happening w/ Bonds

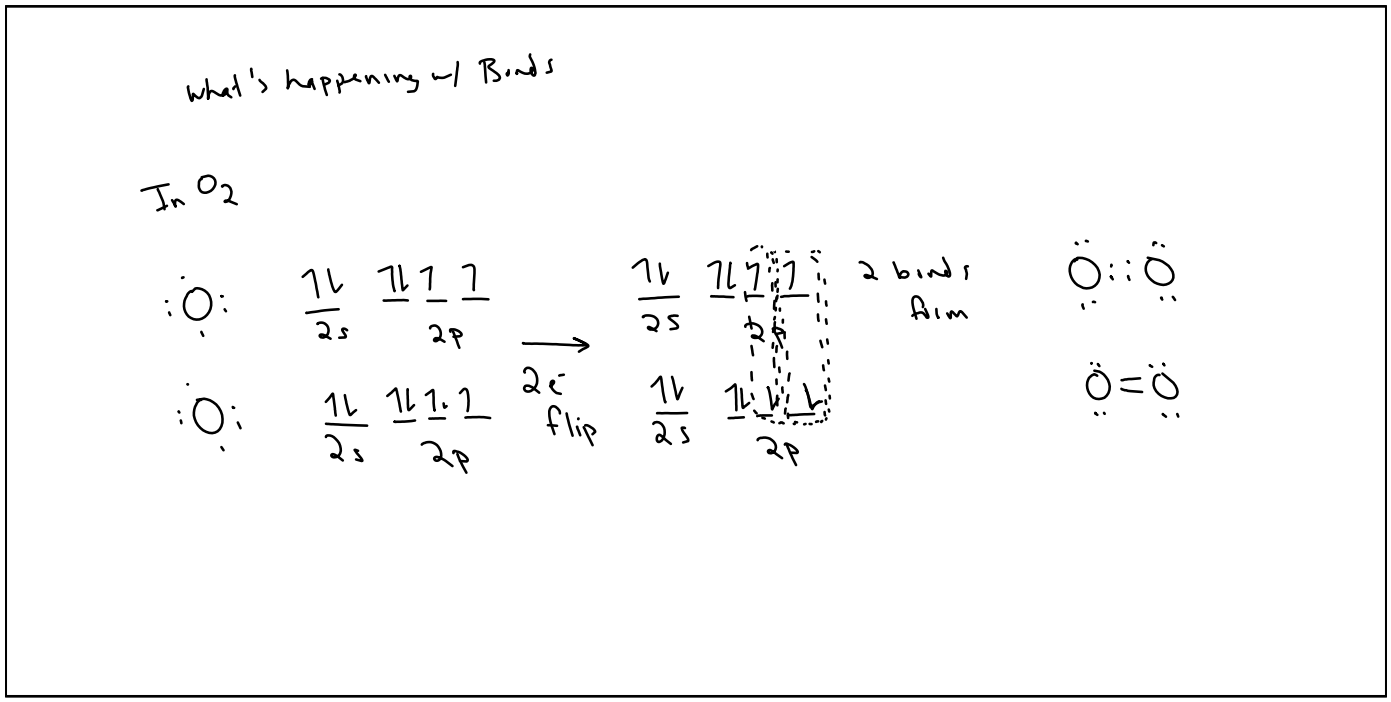
In O_2

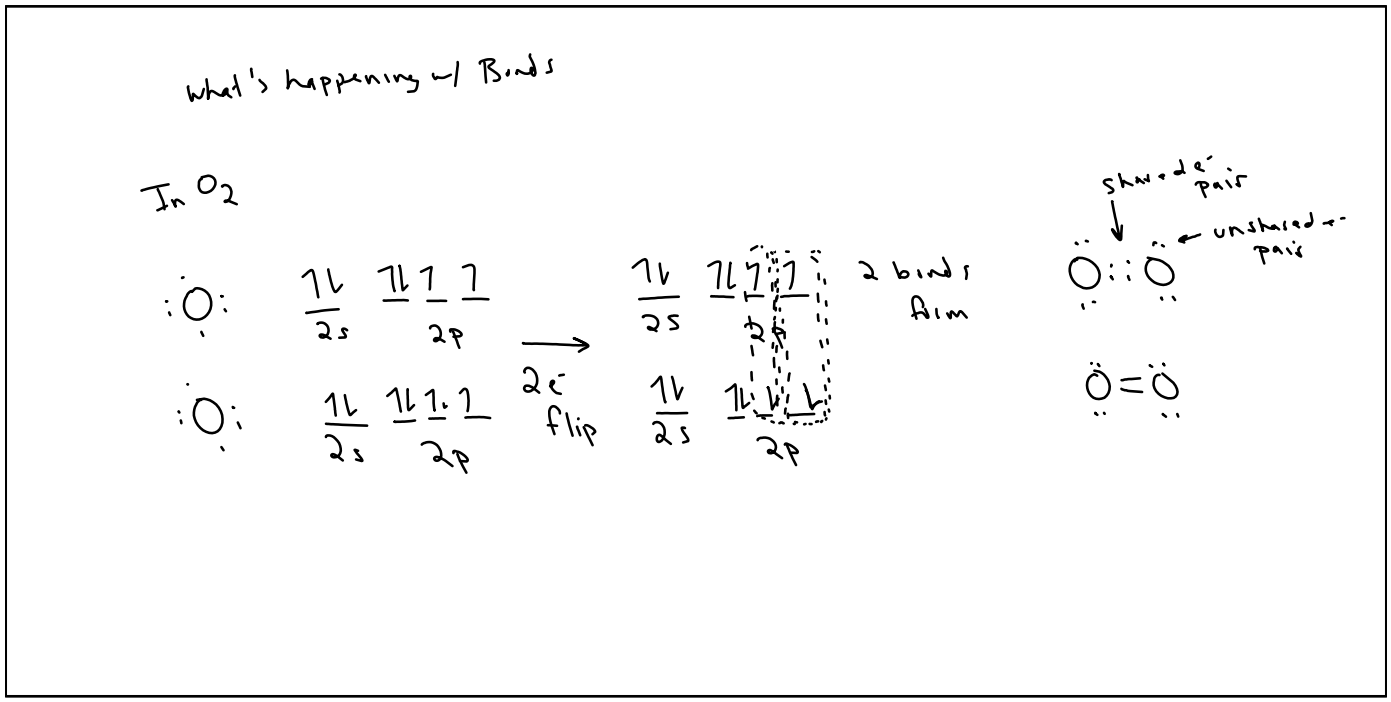


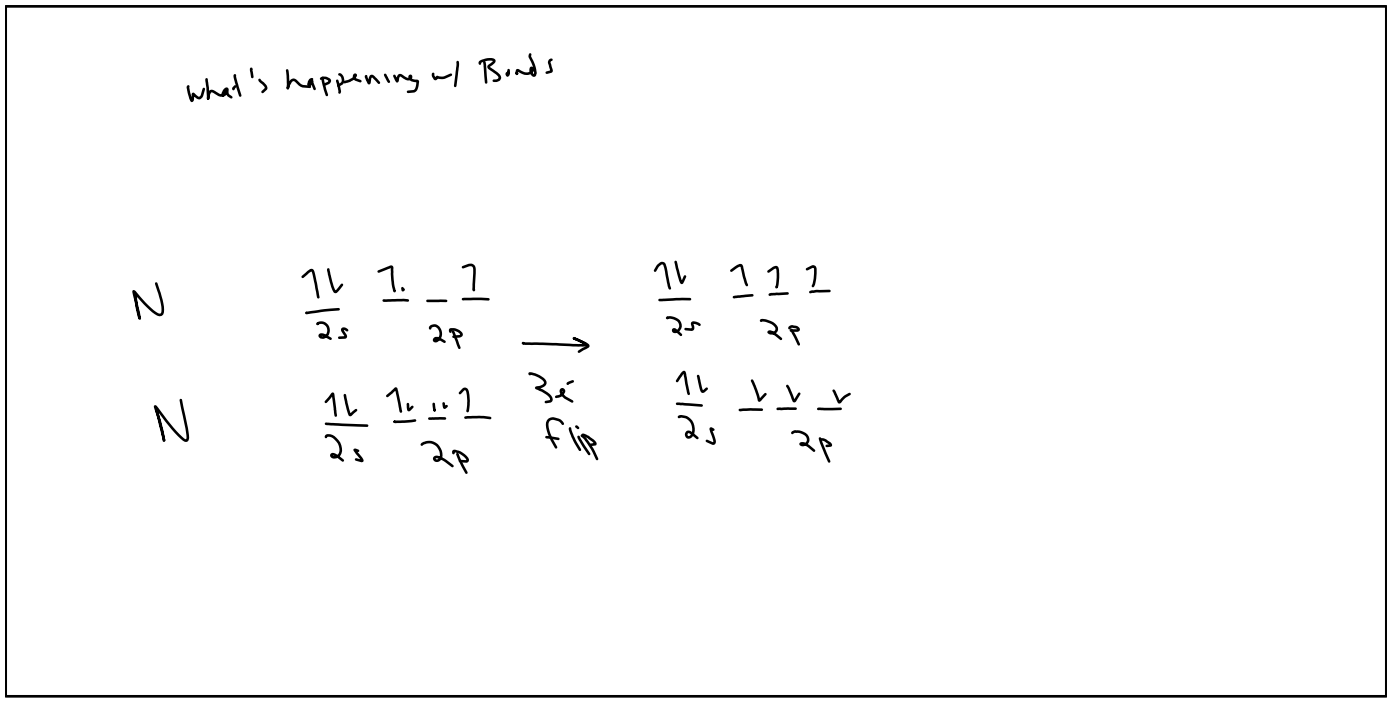
What's happening w/ Bonds

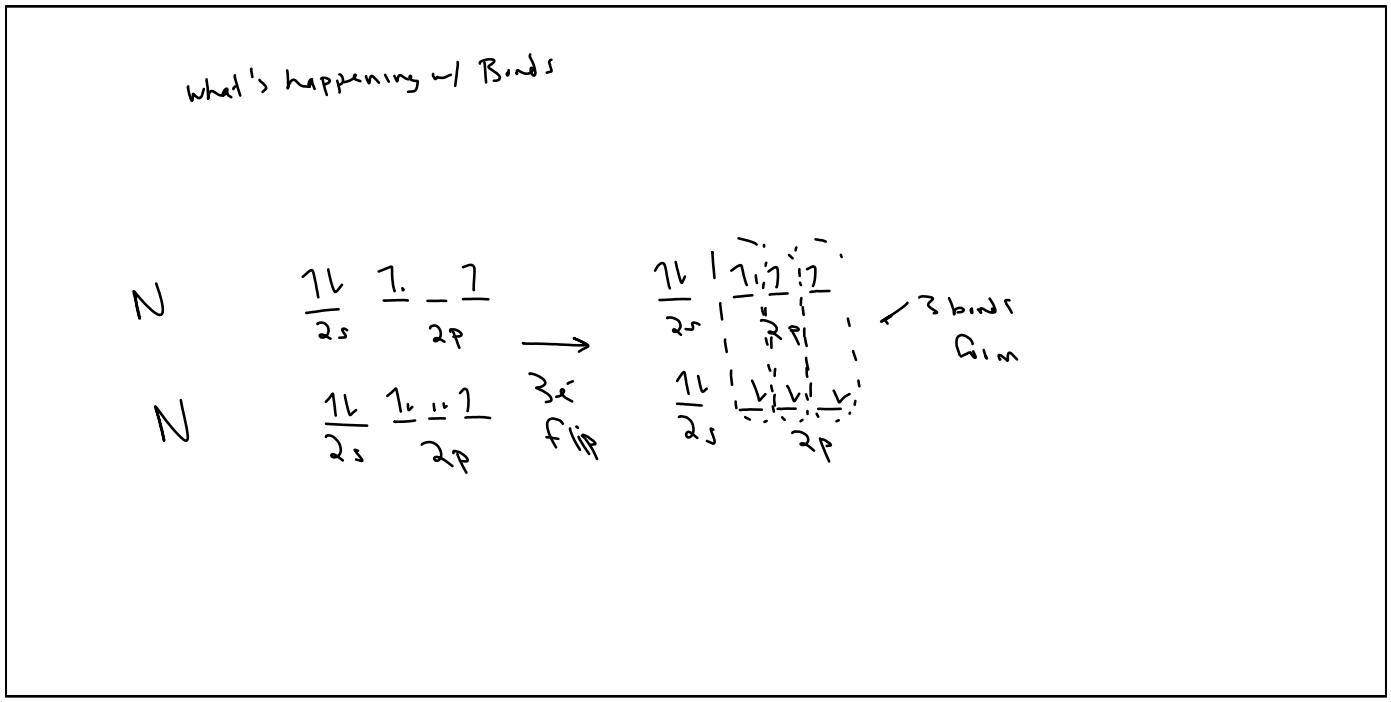
In O_2

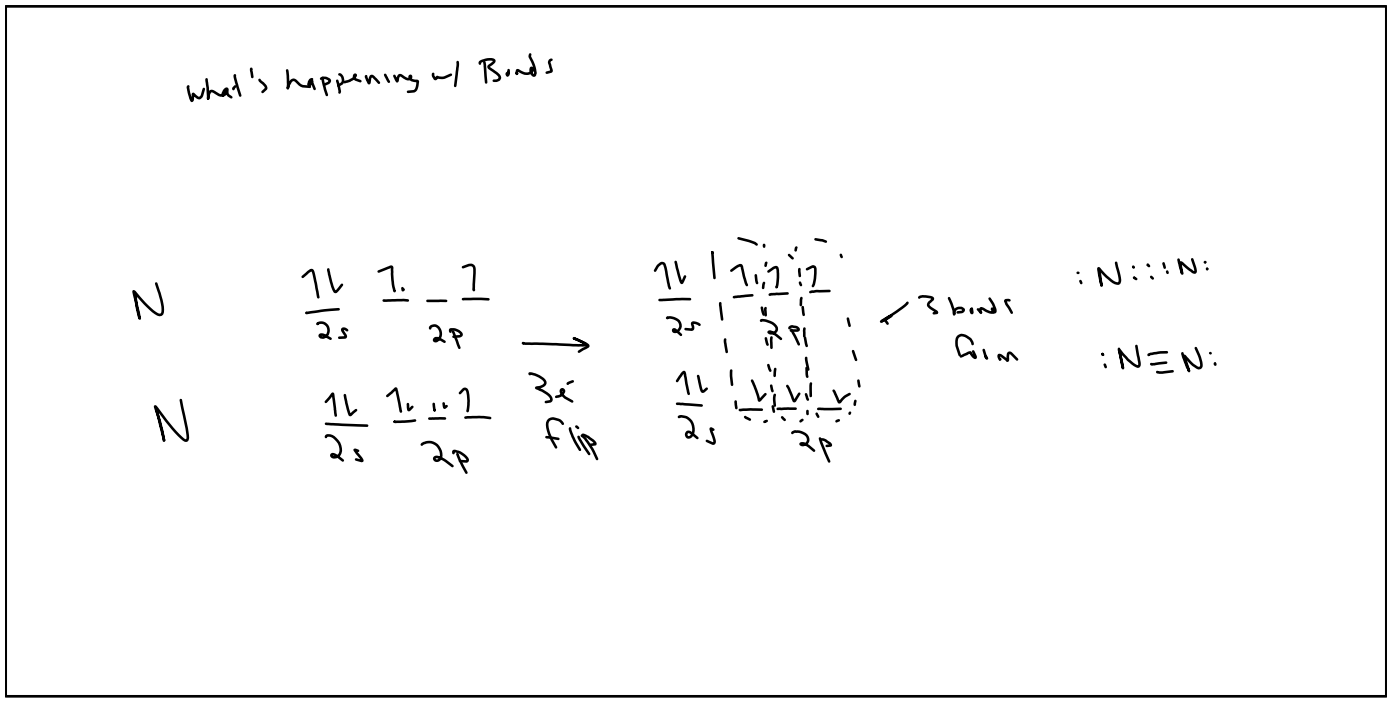


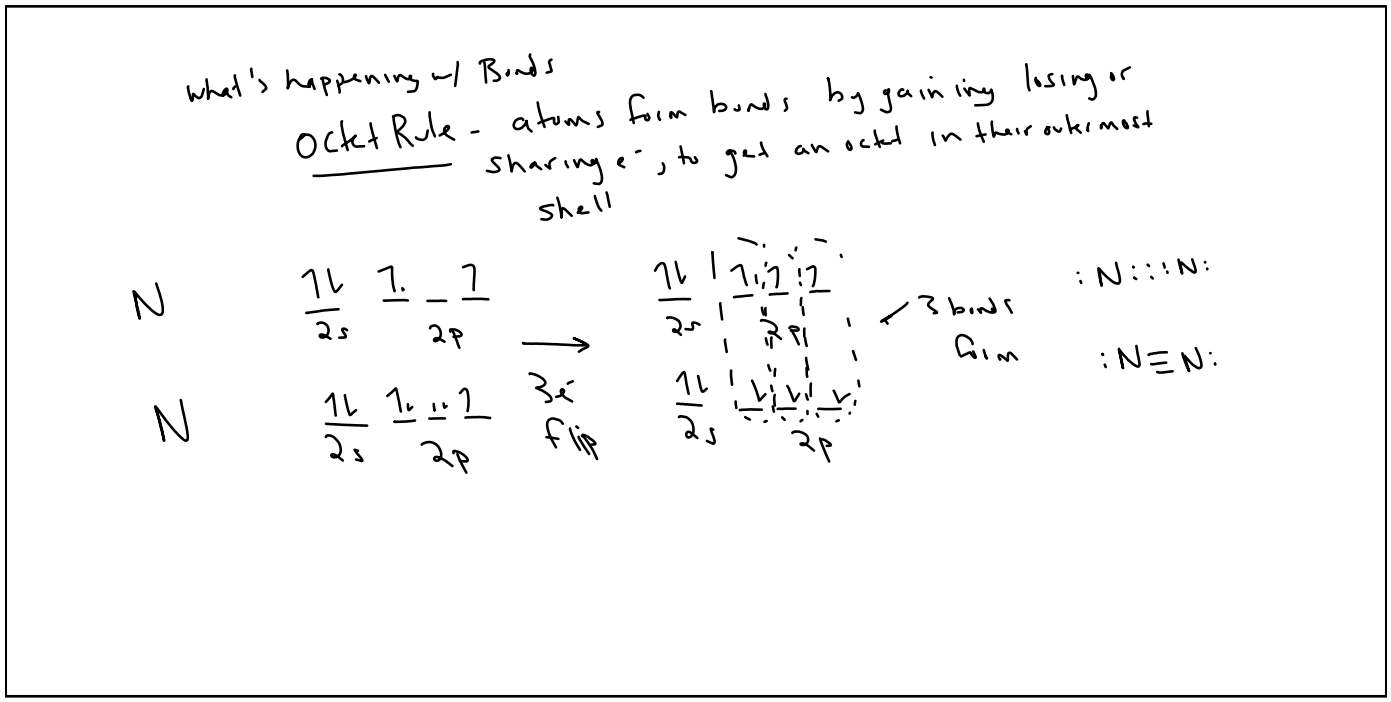

What's happening w/ Bonds
In O_2
2s
2p
2e⁻ flip
2 bonds form


What's happening w/ Bonds
In O_2
2s
2p
2e⁻ flip
2 bonds form
shared e⁻ pair
unshared e⁻ pair


what's happening w/ Bonds
N
2s
2p
N
2s
2p
3e⁻ flip
2s
2p


What's happening w/ Bonds
N
N
3 bonds
Diam


What's happening w/ Bonds
N
N
2s
2p
3e⁻ flip
3 bonds
Diagram
:N:::N:
:N≡N:


What's happening w/ Bonds
Octet Rule - atoms form bonds by gaining losing or sharing e⁻, to get an octet in their outermost shell
N
N
3e⁻ flip
3 bonds form
:N:::N:
:N≡N:

Lewis structures

Lewis structures - indicate bonding in molecules
(x-ture)

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Draw iodomethane, CH_3I

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1. Find total H of val e⁻

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   3 H: 3 × 1 valence e⁻
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Lewis structures - indicate bonding in molecules
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Draw iodomethane, CH_3I

1. Find total # of valence e⁻: 14 valence e⁻
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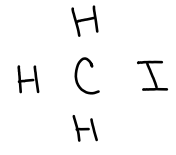

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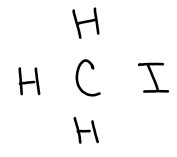

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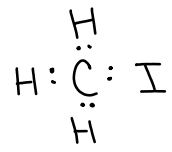

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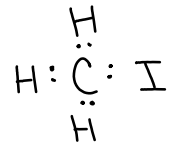

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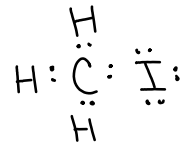

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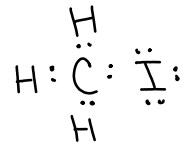
5. Check Math

Draw iodomethane, CH_3I



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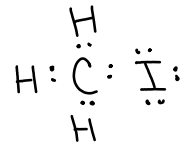
5. Check Math, if you have more e⁻ in xture than you can
   Do Multiple Bonds

Draw iodomethane, CH_3I



Lewis structures - indicate bonding in molecules
(x-tures)

NH_3 , SiI_4 , ICl

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2. Arrange atoms in a simple layout for bonding
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Lewis structures - indicate bonding in molecules
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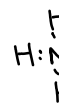

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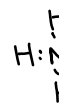

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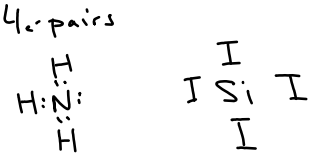

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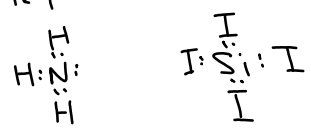

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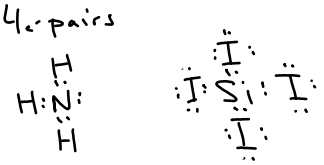

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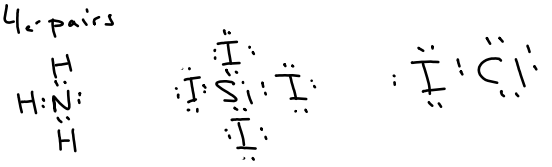

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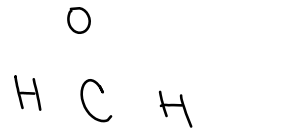

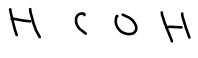

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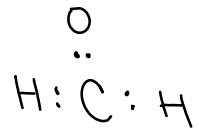

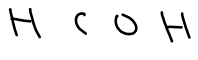

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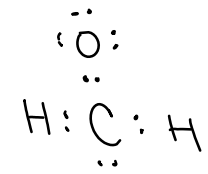

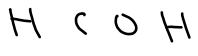

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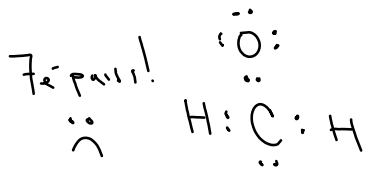

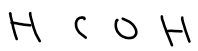

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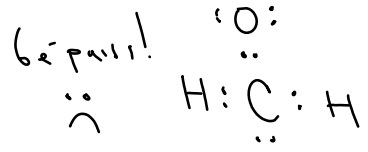

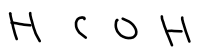

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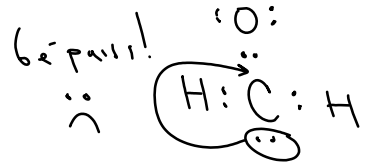

H C O H

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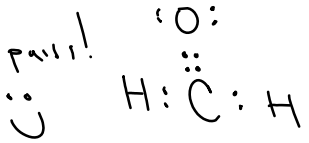

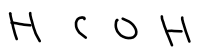

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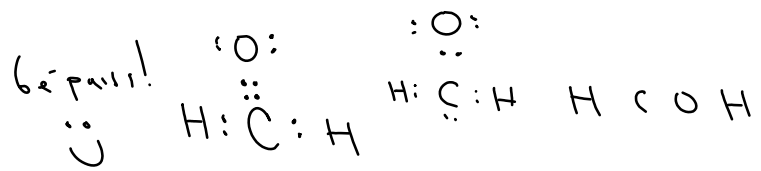

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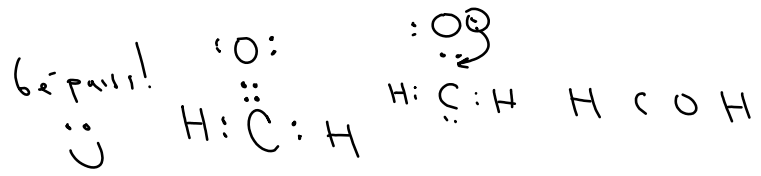

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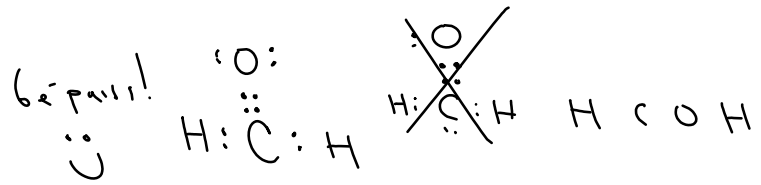

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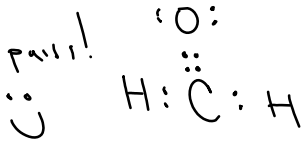

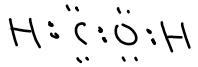

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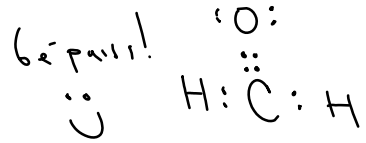

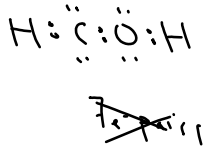

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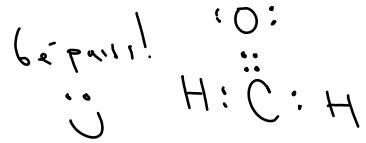

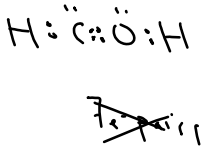

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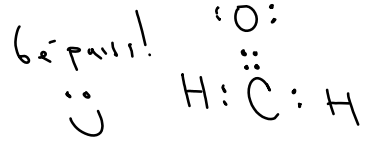

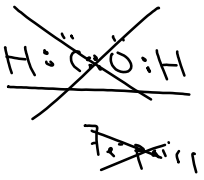

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CH_2O - 6 e⁻ pairs

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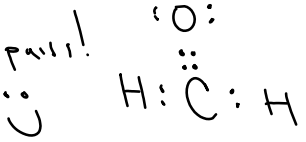
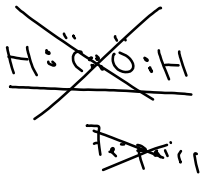
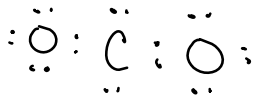


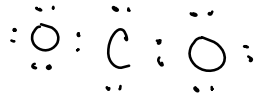
C can't use unshared e⁻ pairs b/c it makes 4 bonds





CO_2

8 pairs



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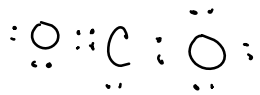

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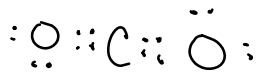

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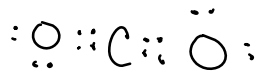


Ions

NH_4^+

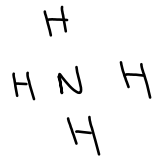
Ions

NH_4^+ ↙lost e^- Blue

Ions

NH_4^+ ↙lost e^- Blit

↳ 8 e^-



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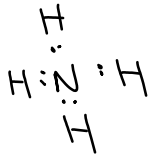

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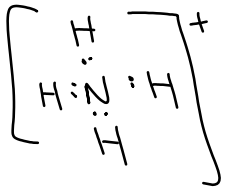

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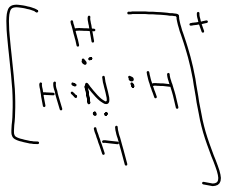
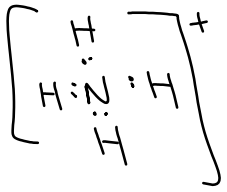


OH^-

Ions

NH_4^+ ← lost e^- Bl. +

↳ 8 e^-

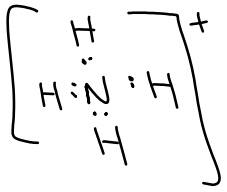


OH^- ← add an e^-

Ions

NH_4^+ ← lost e^- But +

↳ 8 e^-



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Ions

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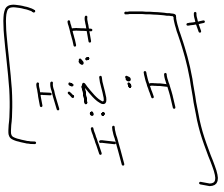

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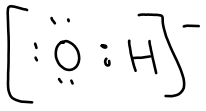

Resonance - multiple Lewis structures possible for the same molecule

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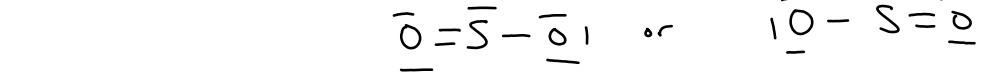

Resonance - multiple Lewis structures possible for the same molecule

↳ happens b/c $\ddot{O}=S-\ddot{O}|$ or $|\ddot{O}-S=\ddot{O}$

↳ e⁻ delocalization

↳ e⁻ move about the structure

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of

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$\ddot{O}=S-\ddot{O}|$

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of

e⁻ delocalization

be- more about the structure $\ddot{O}=\ddot{S}-\ddot{O}:$

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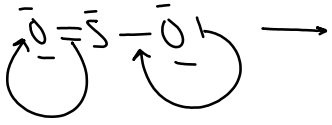
↳ e^- delocalization

↳ e^- more about the structure 

Resonance - multiple Lewis structures possible for the same molecule

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e^- delocalization = be more about the structure

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$\ddot{O}=S-\ddot{O}| \longleftrightarrow |\ddot{O}-S=\ddot{O}$ ← contributing structures

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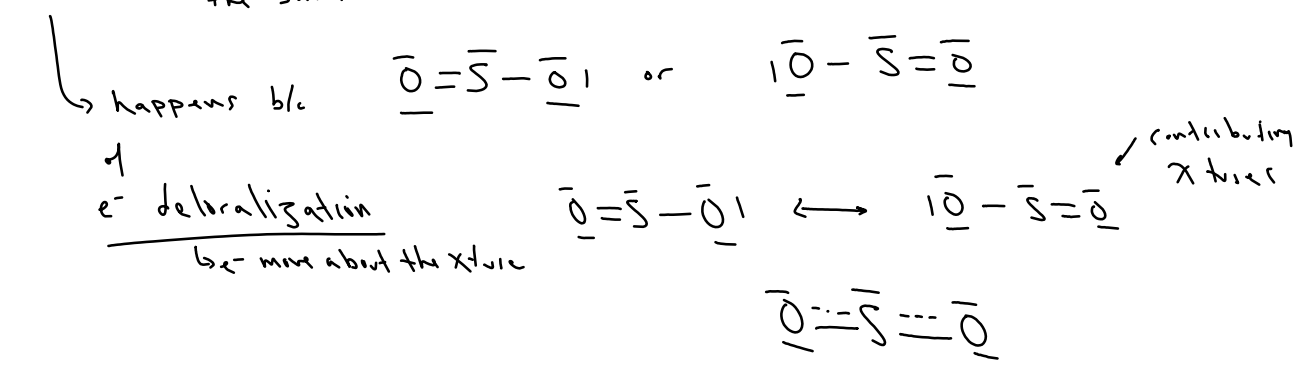

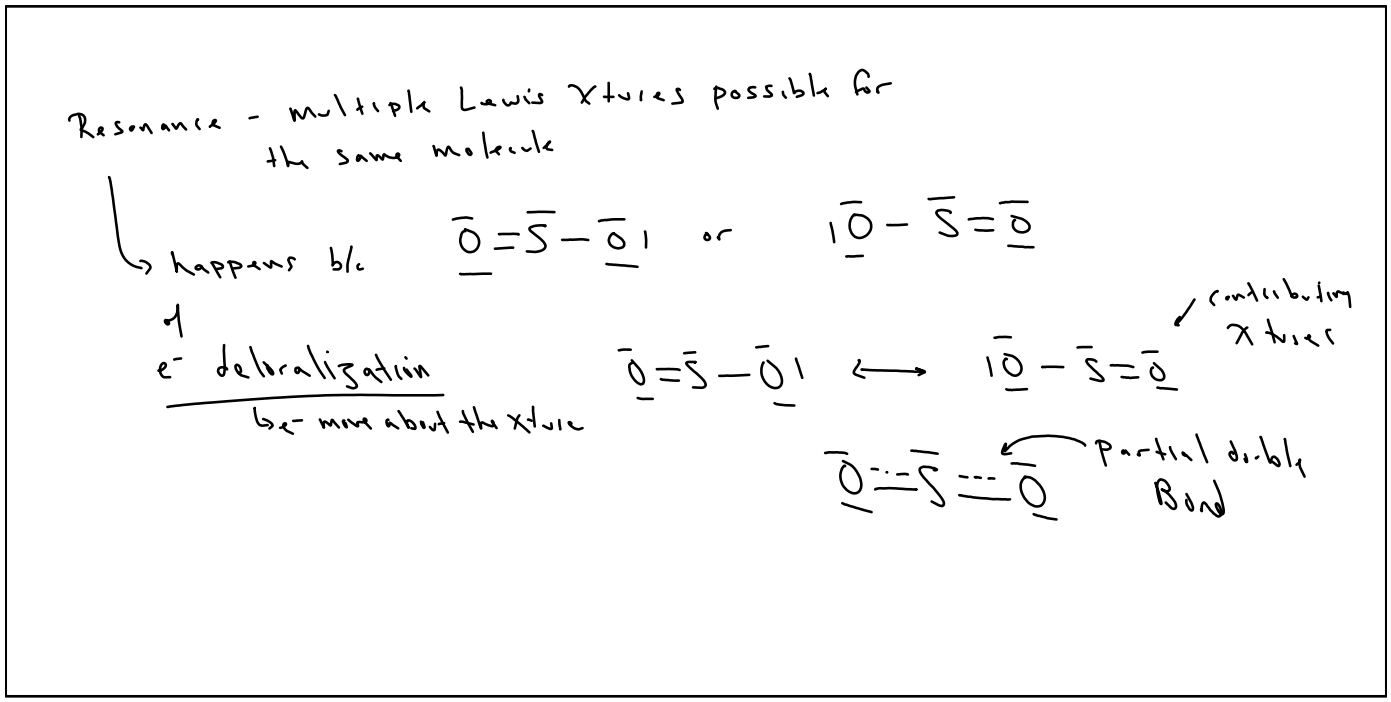
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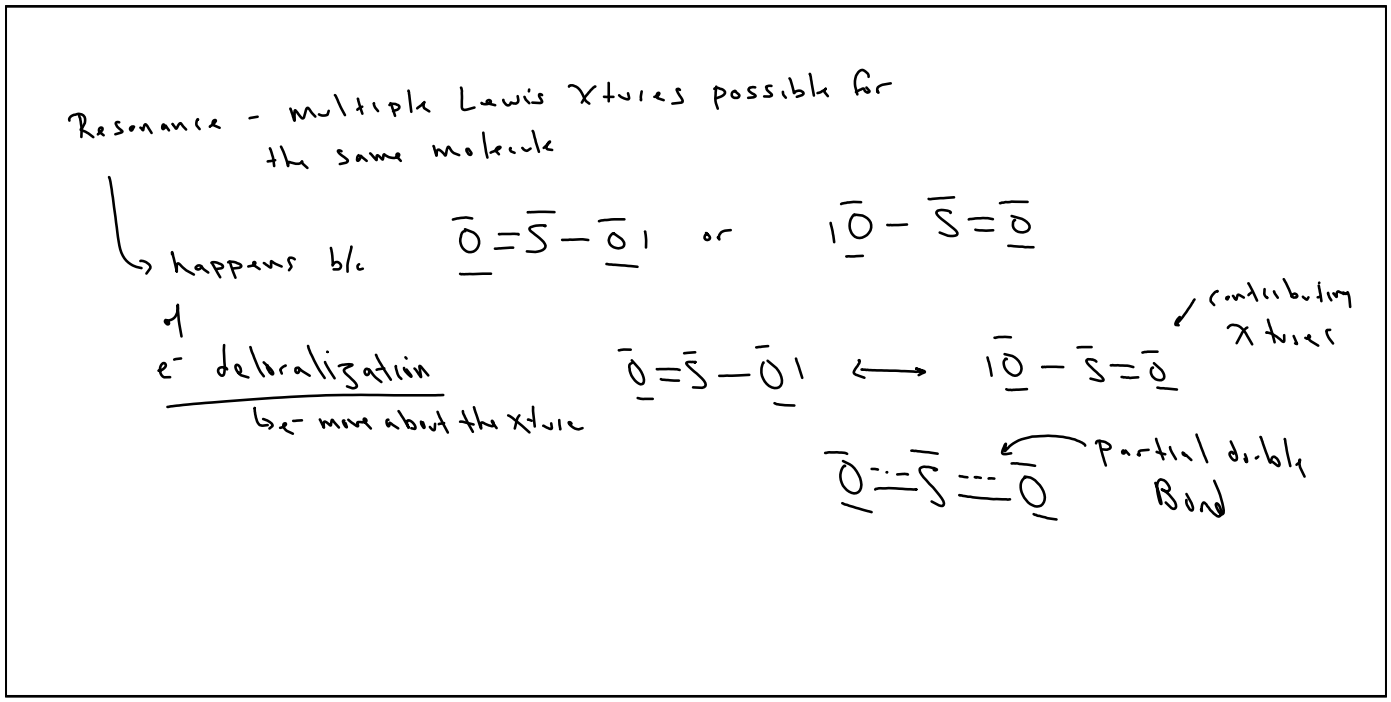
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Summarization

Isomerization
↳ diff compounds w/ the same molecular formulas
^ but all different structures

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$C_2H_4O_2$

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indicates # of atoms of each element.

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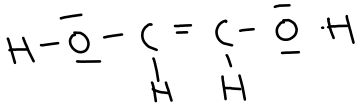

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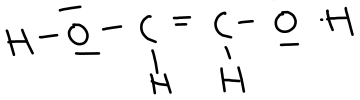

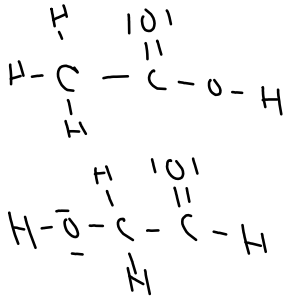

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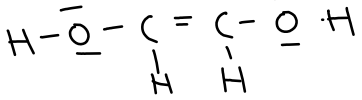
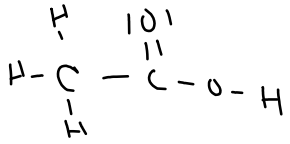
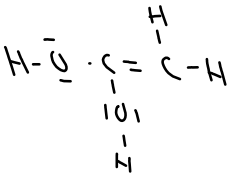
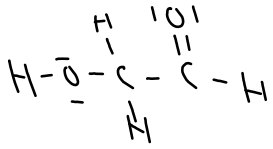








Isomerization

↳ diff compounds w/ the same molecular formulas but all different structures

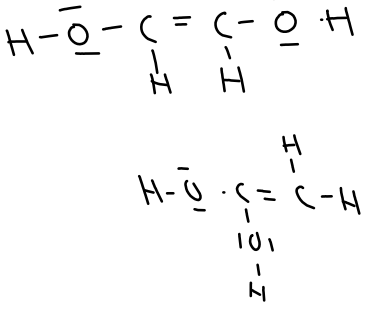
→ All diff compds w/ same molecular formula

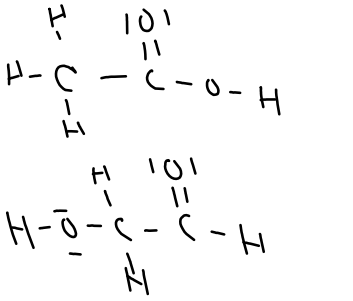
↳ different properties

$C_2H_4O_2$

molec form

indicates # of atoms of each element.





Ionic Bonds

Ionic Bonds

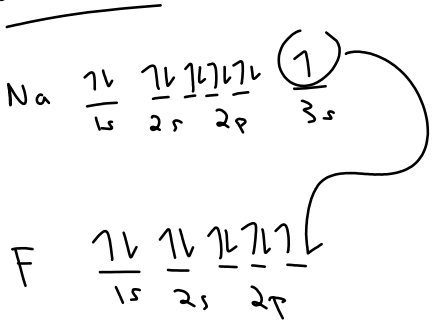
Na $\underline{\uparrow\downarrow}$ $\underline{\uparrow\downarrow}$ $\underline{\uparrow\downarrow}$ $\underline{\uparrow}$ $\underline{\uparrow\downarrow}$ $\underline{\uparrow}$
1s 2s 2p 3s

Ionic Bonds

Na $\underline{\uparrow\downarrow}_{1s}$ $\underline{\uparrow\downarrow}_{2s}$ $\underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}_{2p}$ $\underline{\uparrow}_{3s}$

F $\underline{\uparrow\downarrow}_{1s}$ $\underline{\uparrow\downarrow}_{2s}$ $\underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow}_{2p}$

Ionic Bonds



Ionic Bonds

Na^+ $\underline{\uparrow\downarrow}_{1s}$ $\underline{\uparrow\downarrow}_{2s}$ $\underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}\ \underline{\uparrow\downarrow}_{2p}$

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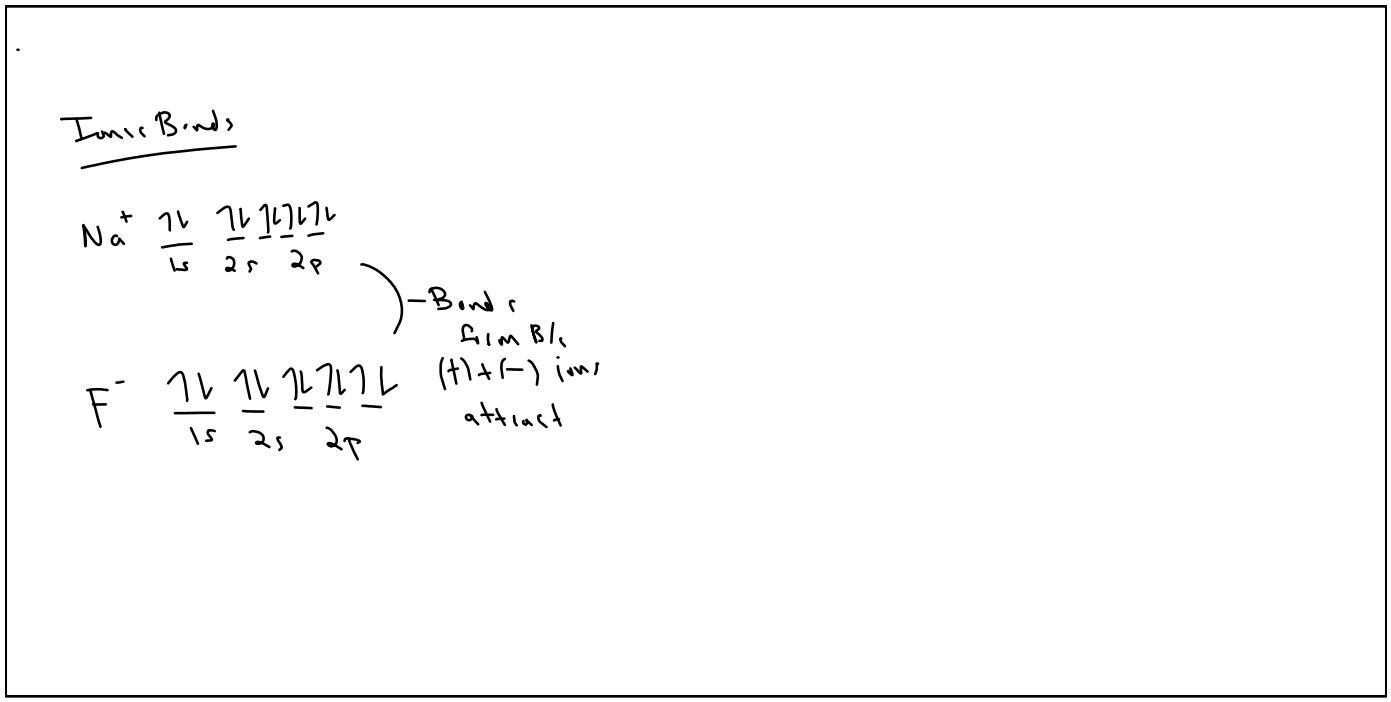
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Na+ 1s 2s 2p
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Bonds form b/c (+)+(−) ions attract

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Na^+ 1s 2s 2p

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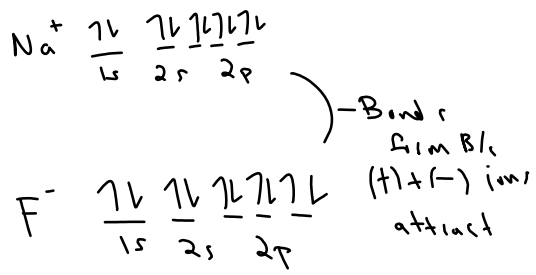
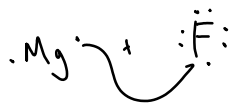
Bonds from B/t (+)+(−) ions attract

.Mg· + :F:

Ionic Bonds





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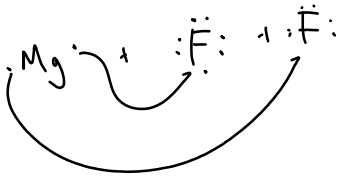

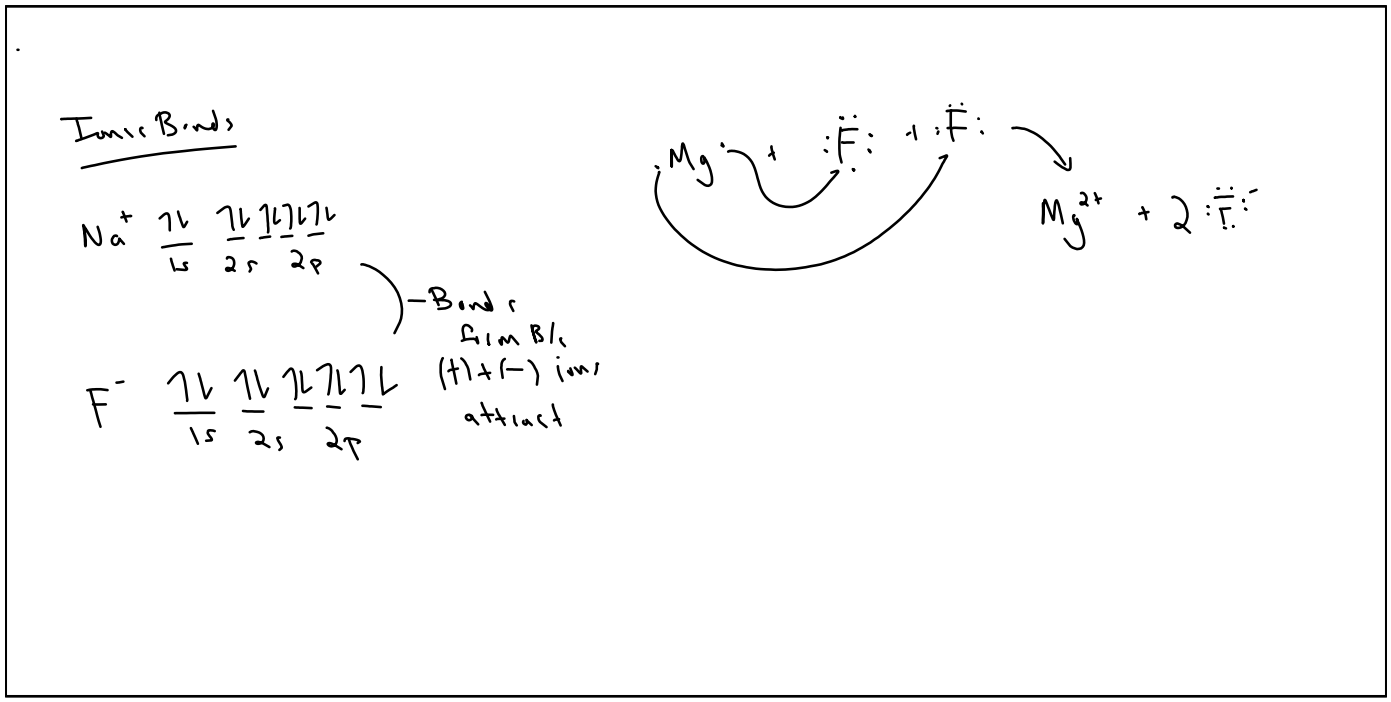
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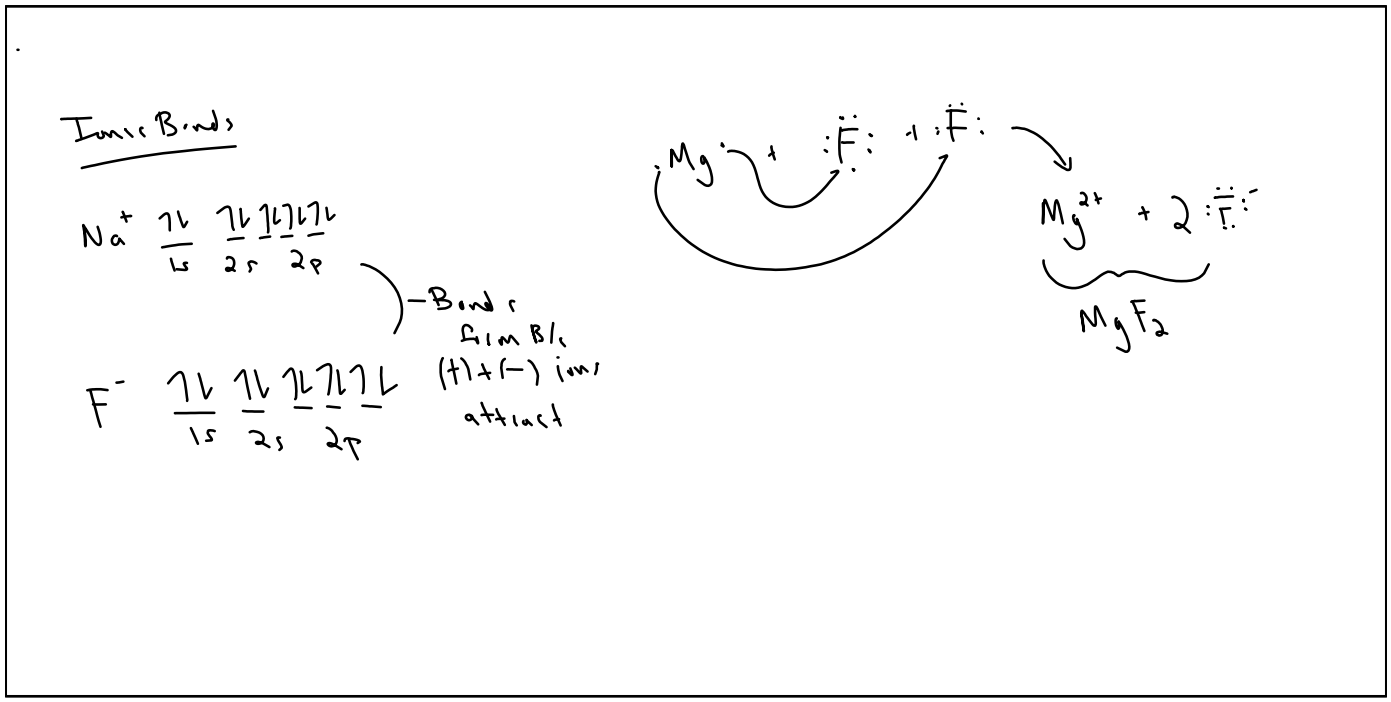
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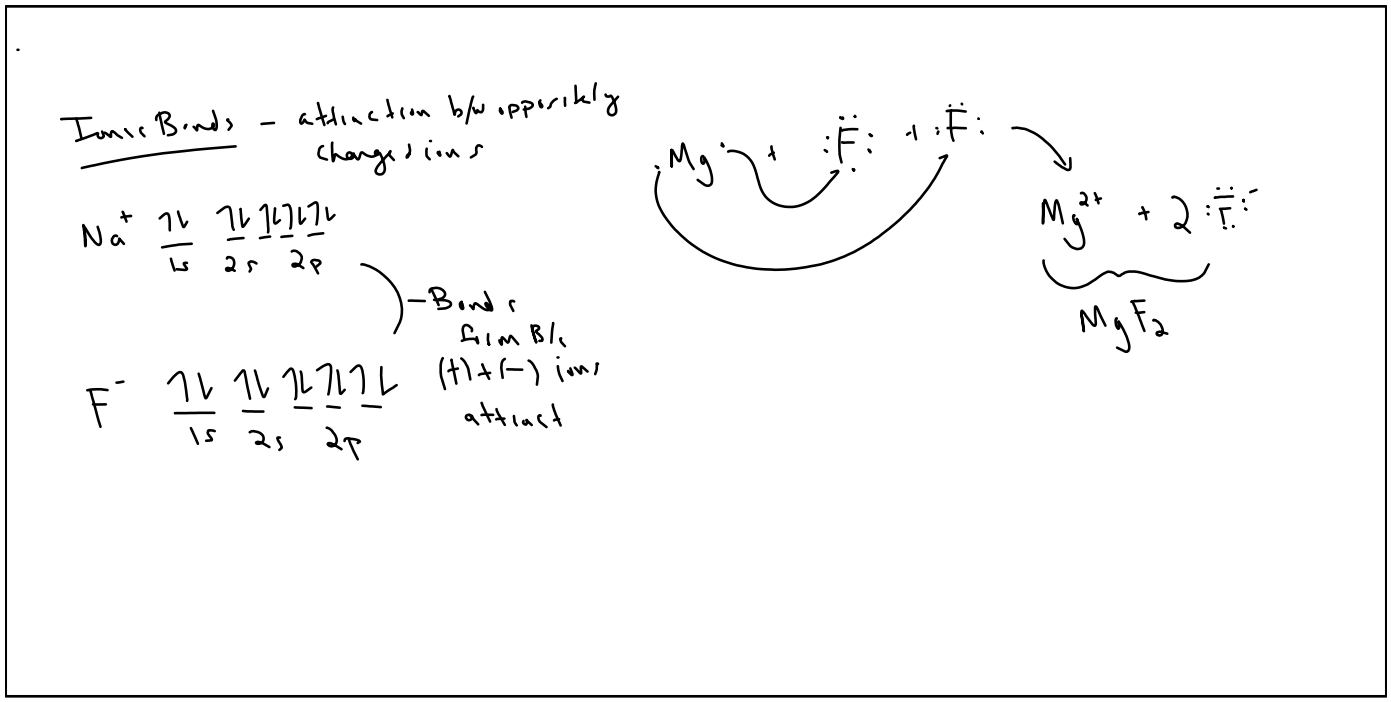
Ionic Bonds - attraction b/w oppositely charged ions
Na+ 1s 2s 2p
F- 1s 2s 2p
Bonds form b/c (+)+(−) ions attract
Mg
F
F
Mg2+ + 2 F-
MgF2

Ionic Xtals

↳ Cations can bind to multiple anions (vice versa) b/c charge goes off in all directions

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→ Ionic comps are Brittle

Metallic Bonding
↳ Low. e-neg

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"Sea of e-"

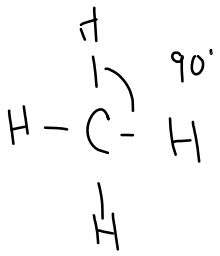
Metallic Bonding

↳ Low e-neg, so not big attraction for e⁻

"Sea of e⁻" - metal "ions" are floating in a "sea" of delocalized valence e⁻

Molecular Geometries

Molecular Geometries



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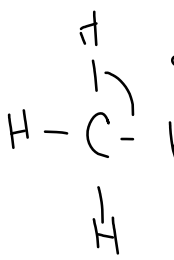

Bonds want to
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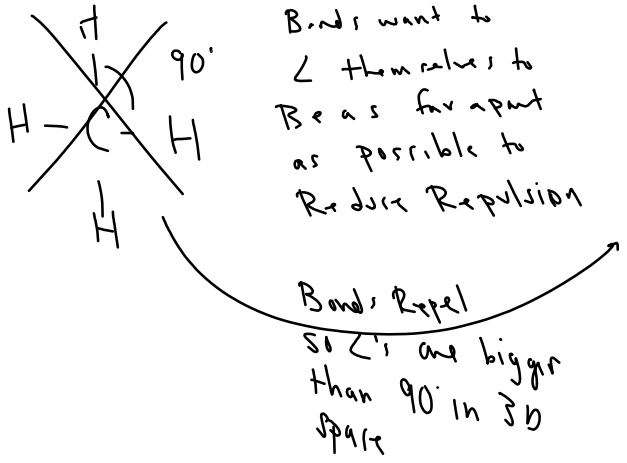
Molecular Geometries



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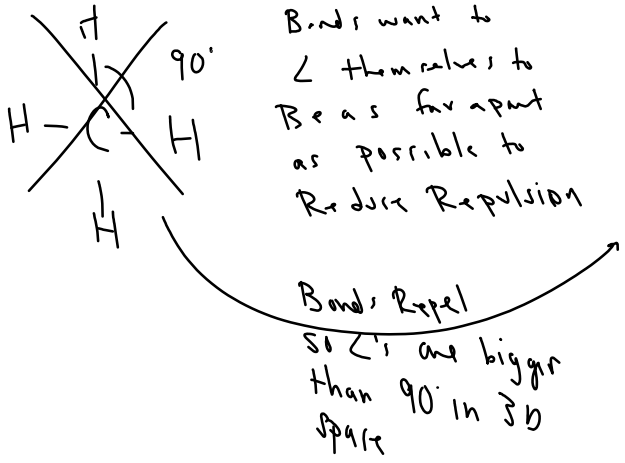

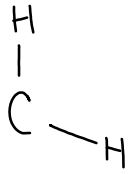

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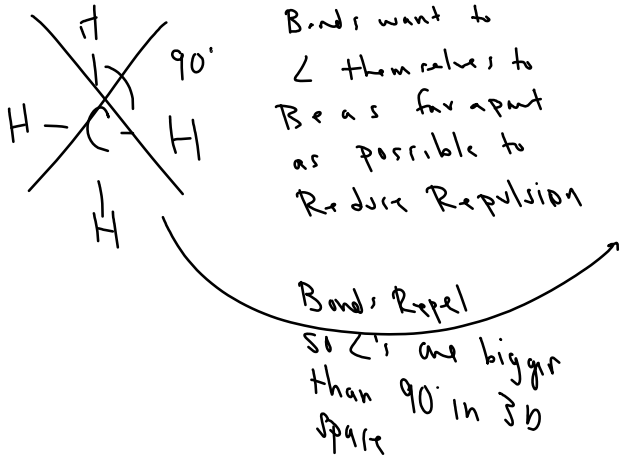

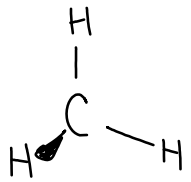

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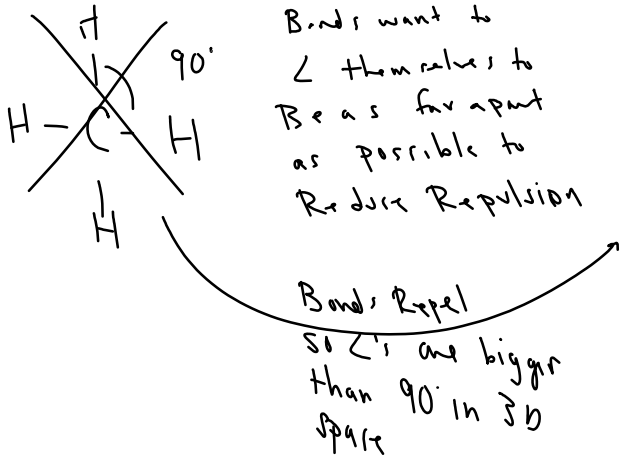
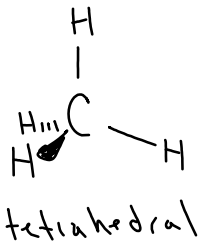
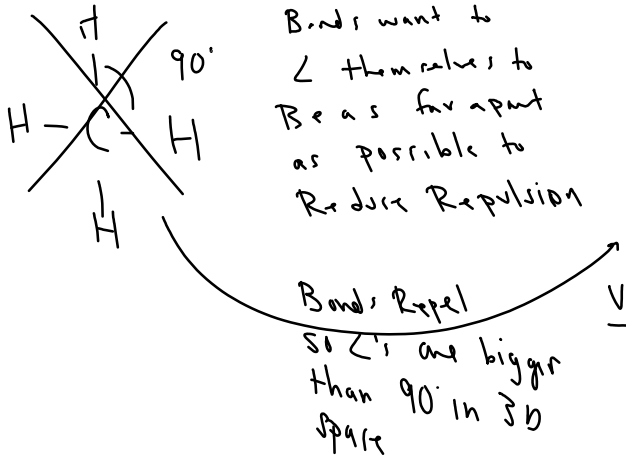




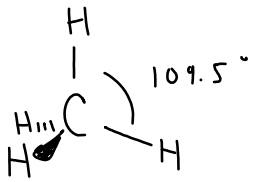
tetrahedral

Molecular Geometries



Bonds want to ∠ themselves to be as far apart as possible to Reduce Repulsion

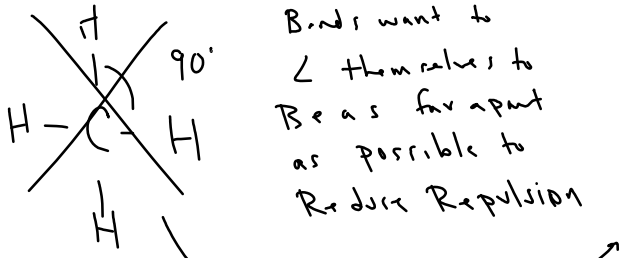
Bonds Repel so ∠'s are bigger than 90° in 3D space



tetrahedral

VSEPR Model of Geometry

Molecular Geometries



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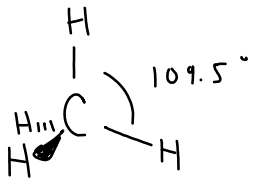

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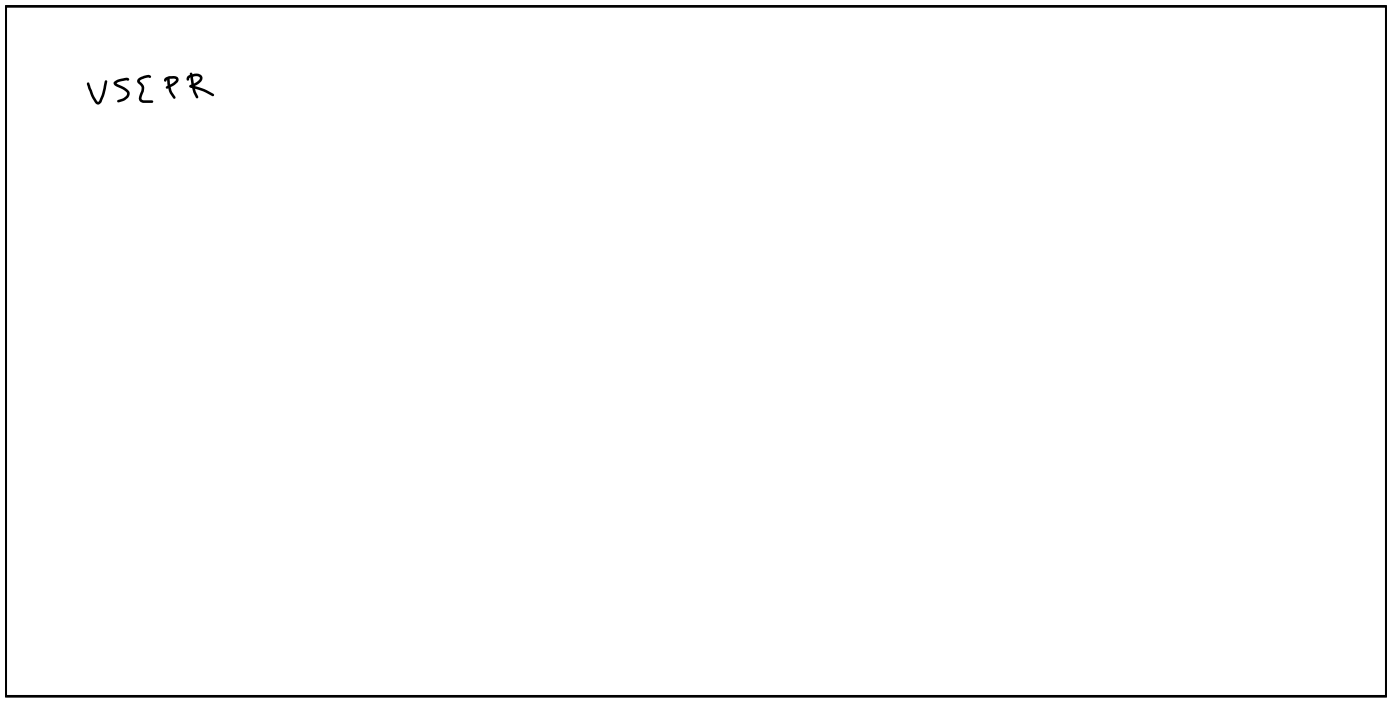
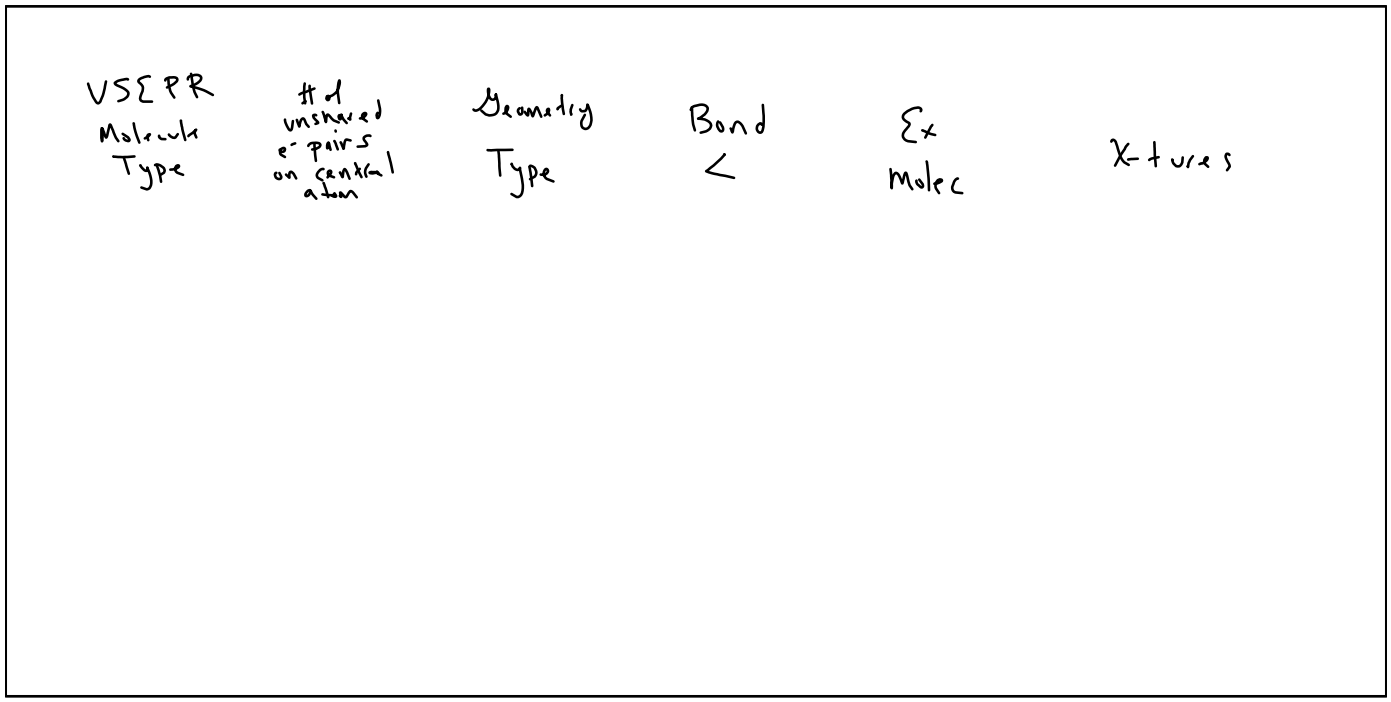
VSEPR Model of Geometry

Valence shell e⁻ pair Repulsion


VSEPR


VSEPR
Molecule
Type
of
unshared
e⁻ pairs
on central
atom
Geometry
Type
Bond
<
Ex
Molec
X-tures

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
				H_2	

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
				H_2	H-H

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond ∠	Ex molec	X-tures
A_2	——	linear	180°*	H_2	H-H

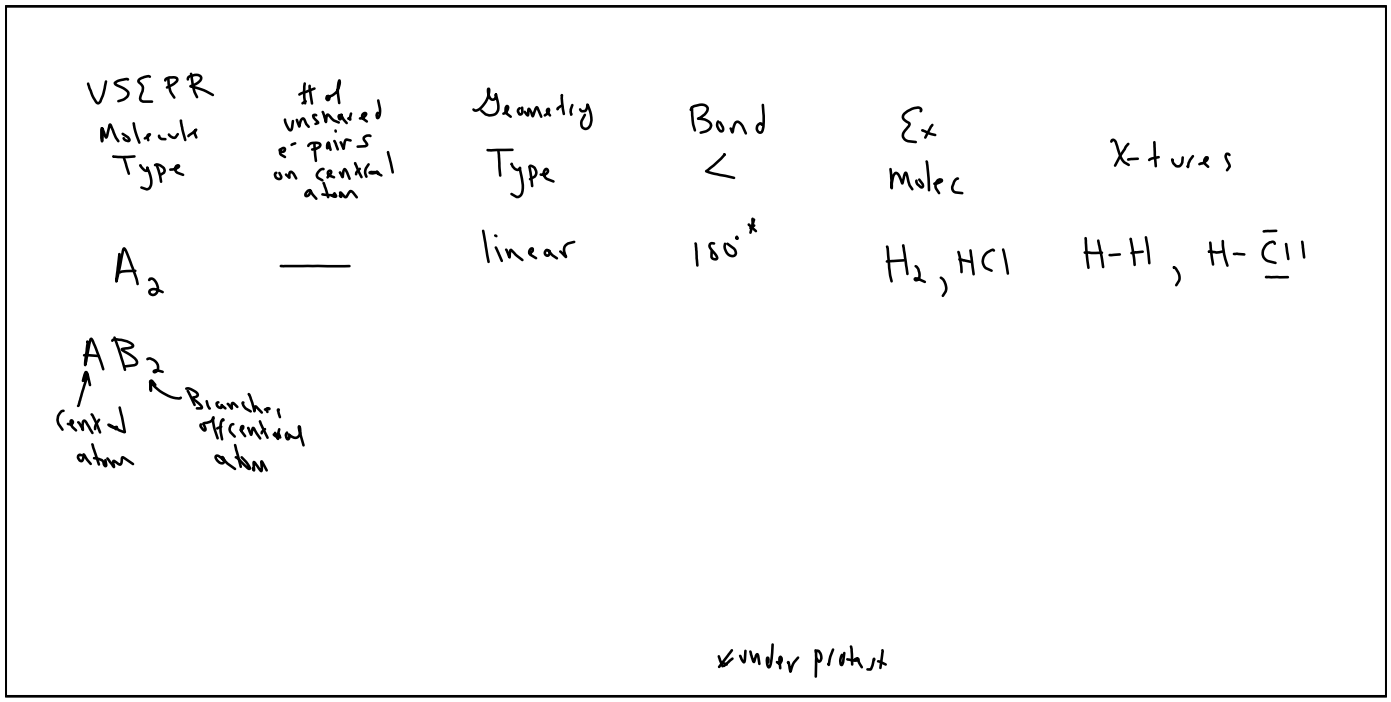
*under pressure

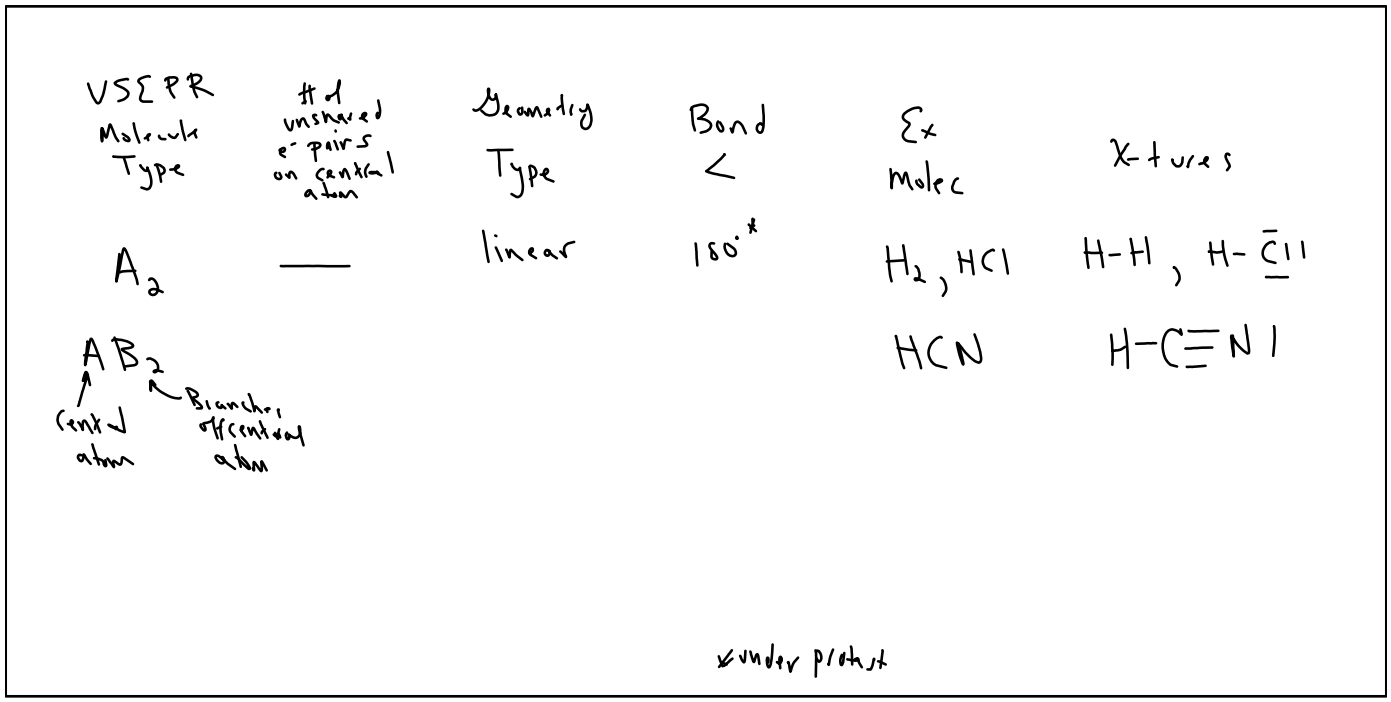
VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond ∠	Ex molec	X-tures
A_2	——	linear	180°*	H_2, HCl	H-H, H-$\bar{\underline{C}}$l

*under pressure

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond ∠	Ex molec	X-tures
A_2	——	linear	180°*	H_2, HCl	H-H, H-$\bar{\underline{C}}$l
AB_2					

*under pressure


VSEPR Molecule Type
# of unshared e⁻ pairs on central atom
Geometry Type
Bond ∠
Ex molec
X-tures
A2
—
linear
180°*
H2, HCl
H-H, H-Cl
AB2
central atom
Branches off central atom
*under pressure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Geometry Type
Bond <
Ex molec
Structures
A2
—
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180°*
H2, HCl
H-H, H-Cl
HCN
H-C≡N
AB2
Central atom
Branches off central atom
*under pressure

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex Molec	X-tures
A_2	——	linear	180°*	H_2, HCl	H-H, H-$\bar{\underline{Cl}}$|
AB_2 (A = central atom, B_2 = branches off central atom)	○	linear	180°	HCN	H-C≡N|

*under pressure

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
A_2	——	linear	180.*	H_2, HCl	H-H , H-$\bar{\underline{Cl}}$|
AB_2	○	linear	180.	HCN	H-C≡N|
AB_3					

*under pressure

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A_2	——	linear	180°*	H_2, HCl	H-H , H-$\bar{\underline{Cl}}$:
AB_2	○	linear	180°	HCN	H-C≡N:
AB_3				BH_3 ↖ violates Octet Rule	

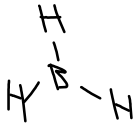
*under 90°

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
A_2	—	linear	180.*	H_2, HCl	H-H , H-$\bar{\underline{Cl}}$ |
AB_2	O	linear	180.	HCN	H-C≡N |
AB_3				BH_3 ↖ violates Octet Rule	H-B(-H)-H

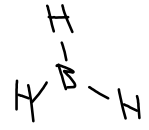
*under platyt

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
A_2	—	linear	180°*	H_2, HCl	H-H , H-$\bar{\underline{Cl}}$|
AB_2	○	linear	180°	HCN	H-C≡N|
AB_3				BH_3 ← violates Octet Rule	H, H–B–H

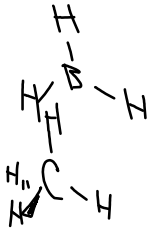
*under pressure

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
A_2	—	linear	180.*	H_2, HCl	H-H, H-$\bar{\underline{Cl}}$|
AB_2	O	linear	180.	HCN	H-C≡N|
AB_3	O	trigonal planar	120.	BH_3 ↖ violates Octet Rule	

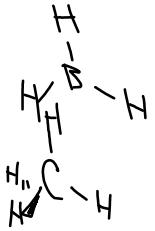
*under ideal

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
A_2	—	linear	180.*	H_2, HCl	H-H , H-$\bar{\underline{Cl}}$|
AB_2	O	linear	180.	HCN	H-C≡N|
AB_3	O	trigonal planar	120.	BH_3	
AB_4				CH_4	

*under pressure

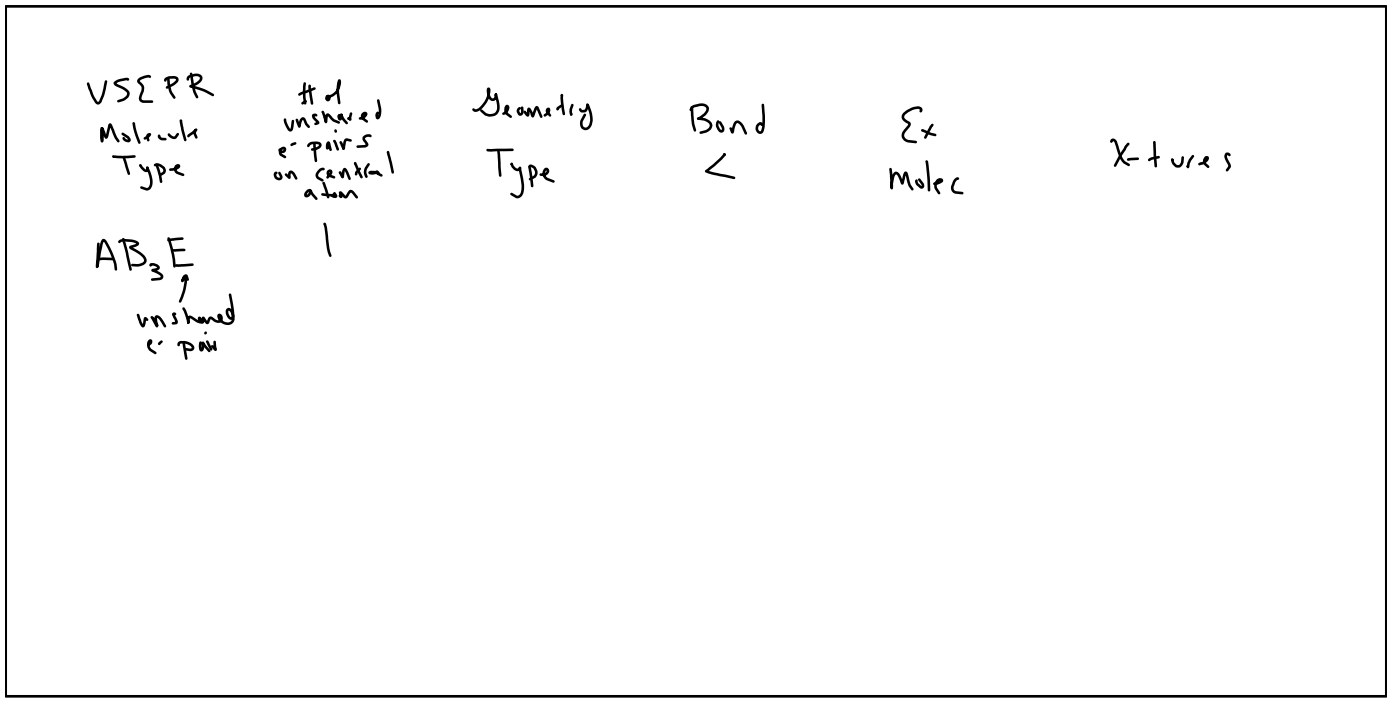
VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
A_2	—	linear	180.*	H_2, HCl	H-H , H-$\bar{\underline{Cl}}$ |
AB_2	O	linear	180.	HCN	H-C≡N |
AB_3	O	trigonal planar	120.	BH_3	
AB_4				CH_4	

*under pressure

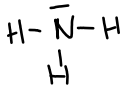
VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex Molec	X-tures
A_2	——	linear	180.*	H_2, HCl	H-H , H-$\bar{\underline{Cl}}$ |
AB_2	O	linear	180.	HCN	H-C≡N |
AB_3	O	trigonal planar	120.	BH_3	
AB_4	O	tetrahedral	109.5.	CH_4	

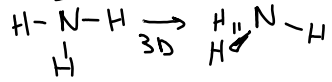
*under pressure

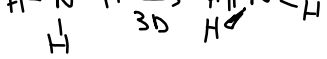
VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
AB_3E	1				

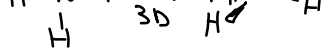
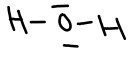

VSEPR
Molecule
Type
of
unshared
e⁻ pairs
on central
atom
Geometry
Type
Bond
<
Ex
Molec
X-tures
AB_3E
unshared
e⁻ pair
1

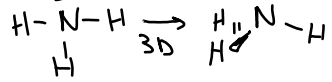
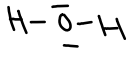
VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex Molec	X-tures
AB_3E (unshared e⁻ pair)	1			NH_3	

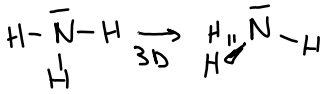
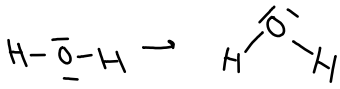
VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex Molec	X-tures
AB_3E (E = unshared e⁻ pair)	1			NH_3	

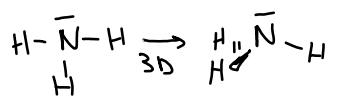
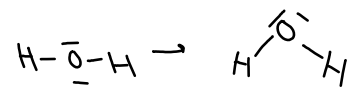
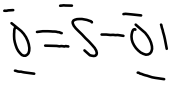
VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond ∠	Ex Molec	X-tures
AB_3E (E = unshared e⁻ pair)	1		107°	NH_3	

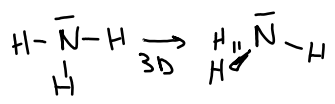
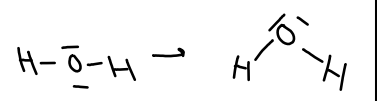
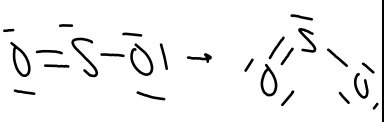
VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex Molec	X-tures
AB_3E (unshared e⁻ pair)	1	trigonal pyramidal	107°	NH_3	
AB_2E_2					

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex molec	X-tures
AB_3E (unshared e⁻ pair)	1	trigonal pyramidal	107°	NH_3	
AB_2E_2				H_2O	

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond <	Ex Molec	X-tures
AB_3E (unshared e⁻ pair)	1	trigonal pyramidal	107°	NH_3	
AB_2E_2	2	Bent		H_2O	

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond ∠	Ex Molec	X-tures
AB_3E (E = unshared e⁻ pair)	1	trigonal pyramidal	107°	NH_3	
AB_2E_2	2	Bent	104.5°	H_2O	

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond ∠	Ex molec	X-tures
AB_3E (unshared e⁻ pair)	1	trigonal pyramidal	107°	NH_3	
AB_2E_2	2	Bent	104.5°	H_2O	
AB_2E				SO_2	

VSEPR Molecule Type	# of unshared e⁻ pairs on central atom	Geometry Type	Bond ∠	Ex Molec	X-tures
AB_3E (E = unshared e⁻ pair)	1	trigonal pyramidal	107°	NH_3	
AB_2E_2	2	Bent	104.5°	H_2O	
AB_2E	1	Bent	~115°	SO_2	

Intermolecular Forces

Intermolecular forces – attractive forces B/w molecules

NOT BONDS!!

Intermolecular forces – attractive forces B/w molecules

NOT BONDS!!

Intermolecular forces – attractive forces B/w molecules

NOT BONDS!!

Caused by Polarity in Molecules

Dipole - Dipole Forces

Dipole - Dipole Forces

↳ 2nd strongest IMF

Dipole - Dipole Forces

- 2nd strongest IMF
- attraction b/w molecules that have Dipoles

Dipole - Dipole Forces

- 2nd strongest IMF
- attraction b/w molecules that have Dipoles

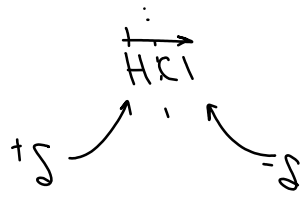
HCl

Dipole - Dipole Forces

- 2nd strongest IMF
- attraction b/w molecules that have Dipoles

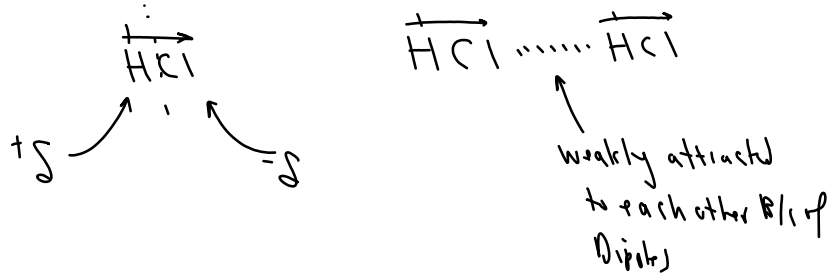
Dipole - Dipole Forces

- 2nd strongest IMF
- attraction b/w molecules that have Dipoles



Dipole - Dipole Forces

- 2nd strongest IMF
- attraction b/w molecules that have Dipoles



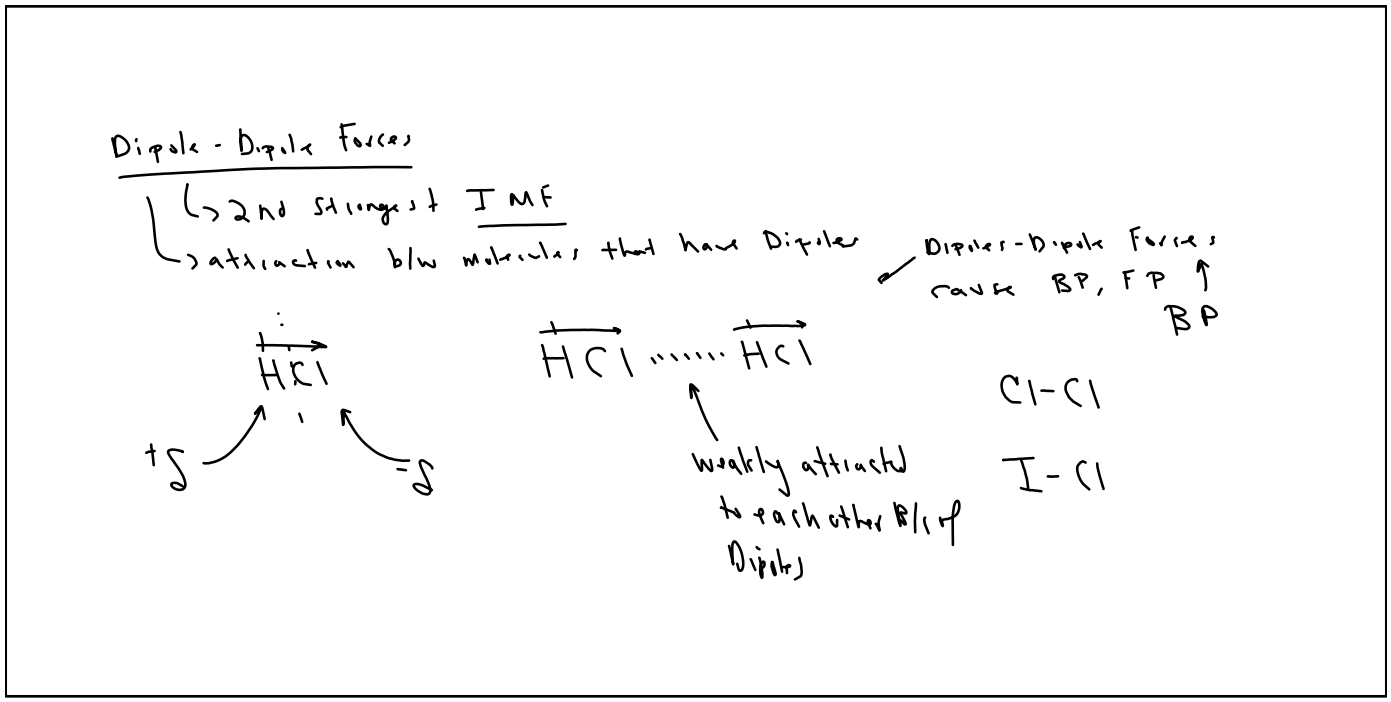
Dipole - Dipole Forces

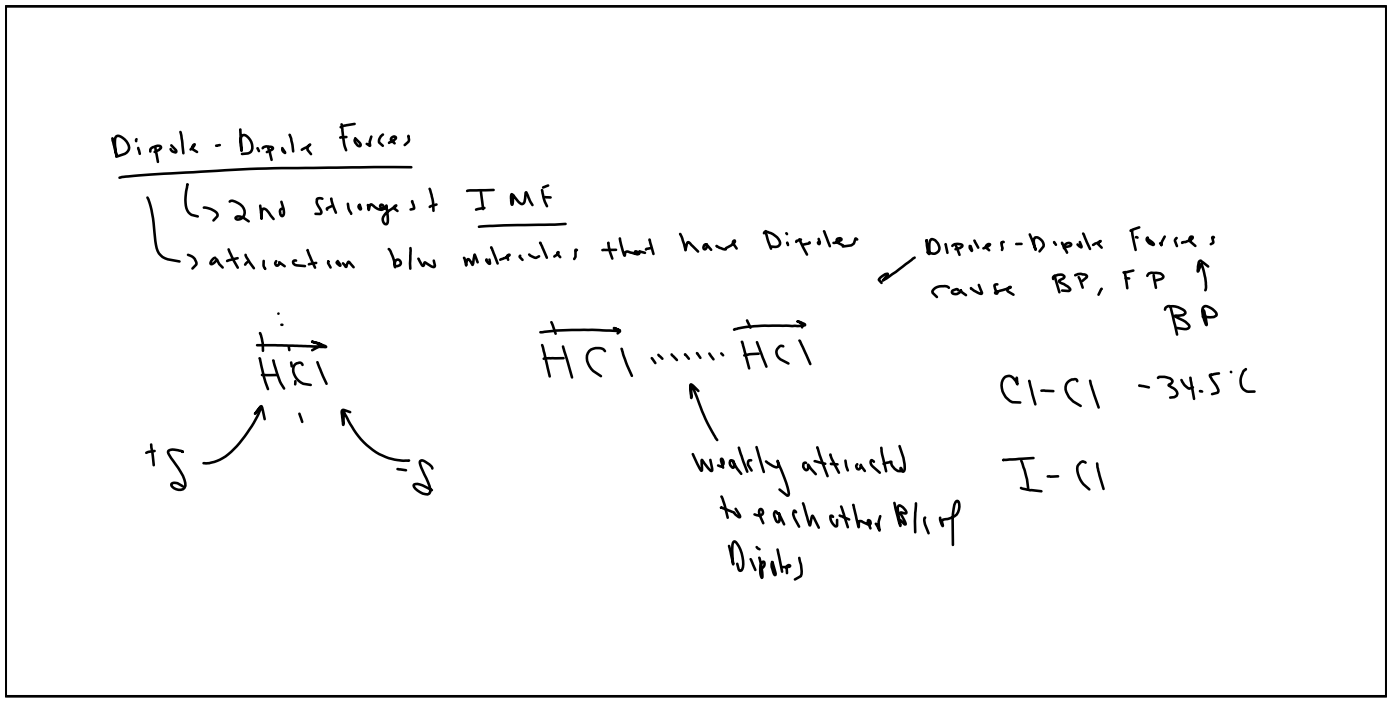
↳ 2nd strongest IMF

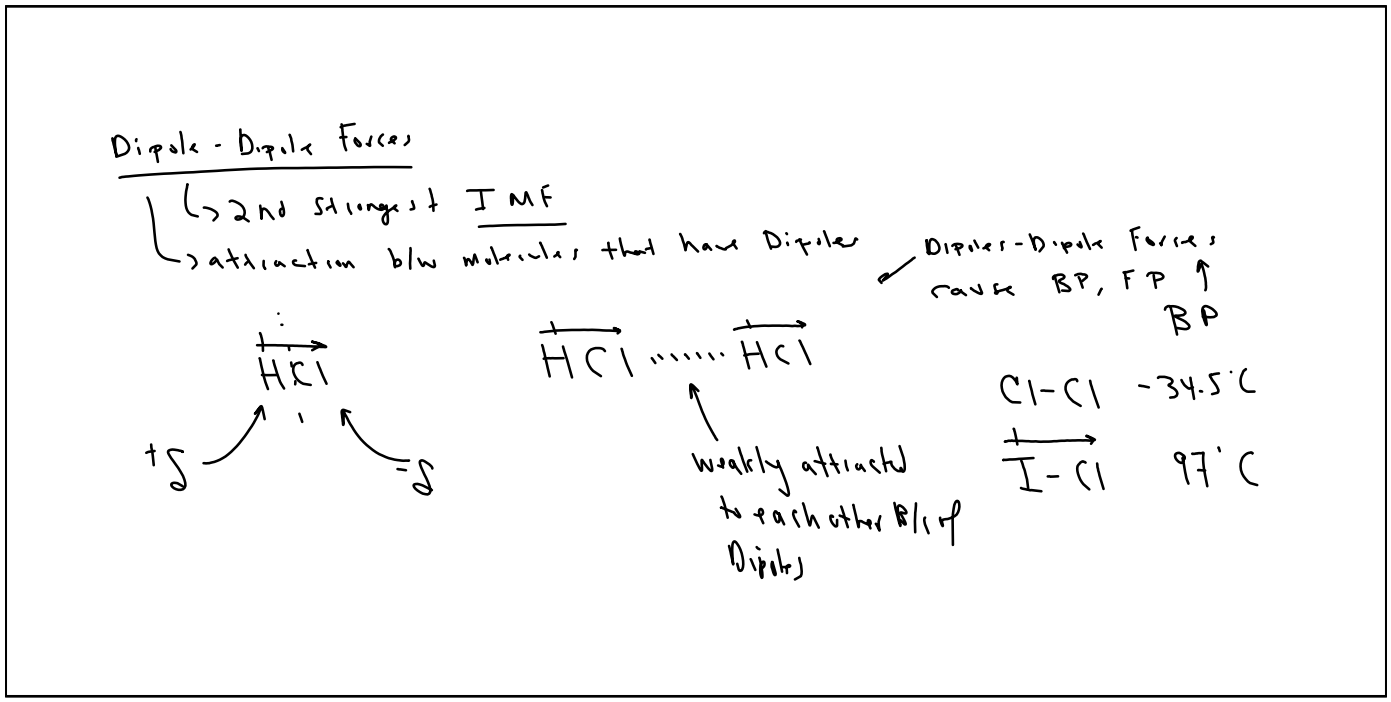
↳ attraction b/w molecules that have Dipoles

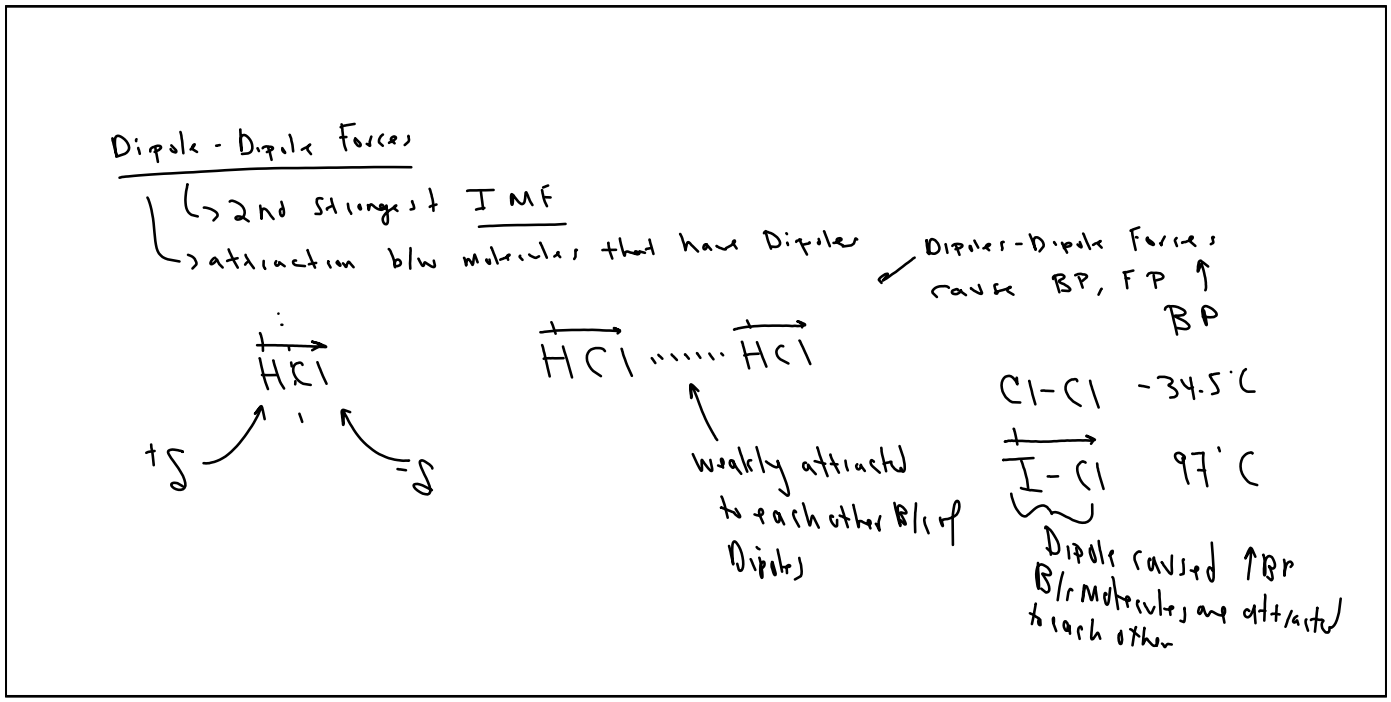
Dipoles-Dipole Forces cause BP, FP ↑

weakly attracted to each other B/c of Dipoles


Dipole - Dipole Forces
2nd strongest IMF
attraction b/w molecules that have Dipoles
Dipoles-Dipole Forces cause BP, FP ↑ BP
HCl
+δ
−δ
HCl ..... HCl
weakly attracted to each other B/c of Dipoles
Cl-Cl
I-Cl


Dipole - Dipole Forces
2nd strongest IMF
attraction b/w molecules that have Dipoles
Dipoles - Dipole Forces cause BP, FP ↑
BP
HCl
+δ
−δ
HCl ..... HCl
weakly attracted to each other B/c of Dipoles
Cl-Cl -34.5°C
I-Cl


Dipole - Dipole Forces
2nd strongest IMF
attraction b/w molecules that have Dipoles
Dipoles - Dipole Forces cause BP, FP ↑
BP
HCl
+δ
−δ
HCl ..... HCl
weakly attracted to each other B/c of Dipoles
Cl-Cl -34.5°C
I-Cl 97°C


Dipole - Dipole Forces
2nd strongest IMF
attraction b/w molecules that have Dipoles
Dipoles - Dipole Forces cause BP, FP ↑
BP
HCl
δ+
δ-
HCl ..... HCl
weakly attracted to each other B/c of Dipoles
Cl-Cl -34.5°C
I-Cl 97°C
Dipole caused ↑BP
B/c Molecules are attracted to each other

Hydrogen Bonds

Hydrogen Bonds - (Not a Bond)

↳ strongest IMF

Hydrogen Bonds - (Not a Bond)

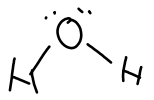
↳ strongest IMF

↳ H which is bonded to a strongly e- neg element (N, O, F) is attracted an unshared e⁻ pair on another strongly e- neg element.

Hydrogen Bonds - (Not a Bond)

↳ strongest IMF

↳ H which is bonded to a strongly e- neg element (N, O, F) is attracted an unshared e⁻ pair on another strongly e- neg element.



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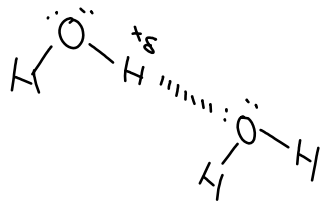
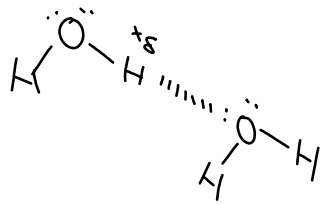


Hydrogen Bonds - (Not a Bond)

↳ strongest IMF

↳ H which is bonded to a strongly e- neg element (N, O, F) is attracted an unshared e- pair on another strongly e- neg element. prop of H_2O b/c of H-Bonds



Hydrogen Bonds - (Not a Bond)

↳ strongest IMF

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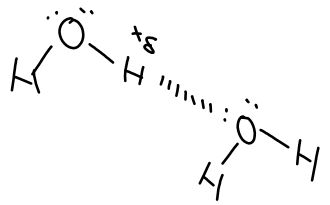
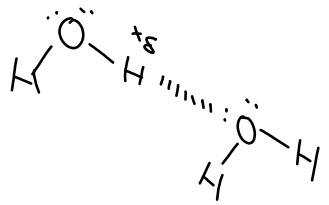


prop of H_2O b/c of H-Bonds
- surface T
- meniscus shape

Hydrogen Bonds - (Not a Bond)

↳ strongest IMF

↳ H which is bonded to a strongly e- neg element (N, O, F) is attracted an unshared e- pair on another strongly e- neg element.



prop of H_2O b/c of H-Bonds
- surface T
- meniscus shape
- capillary action
- solid is less Dense compared to liq.